PB85-247013

Standardization of EPA (Environmental Protection Agency) Method 8610

Battelle Columbus Labs., OH

Prepared for

Environmental Monitoring and Support Lab.
Cincinnati, OH

Jul 85

U.S. Department of Commerce
National Technical Information Service
NTIS

PB85-247013

EPA/600/4-85/052
July 1985

STANDARDIZATION OF EPA METHOD 8610

by

T. F. Cole, A. Riggin,
and W. M. Cooke

BATTELLE
Columbus Laboratories
Columbus, Ohio 43201-2693

Contract Number 68-03-1760
Work Assignment 10

Project Officer

Fred K. Kawahara, Ph.D.
Environmental Monitoring and Support Laboratory
U.S. Environmental Protection Agency
Cincinnati, Ohio 45268

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

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SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/600/4-85/052	2.
3. RECIPIENT'S ACCESSION NO. PB85 247013/AS	
4. TITLE AND SUBTITLE "Standardization of EPA Method 8610"	5. REPORT DATE July 1985
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) T.F. Cole, A. Riggin, W.M. Cooke	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Battelle Columbus Laboratories Columbus, Ohio 453201-2693	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO. 68-03-1760 - WA 10
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Research and Development Environmental Monitoring and Support Laboratory 26 W. St. Clair St., Cincinnati, Ohio 45268	13. TYPE OF REPORT AND PERIOD COVERED Project Report: May 1984-Feb. 1985
	14. SPONSORING AGENCY CODE EPA 600/06

15. SUPPLEMENTARY NOTES

16. ABSTRACT

USEPA Method 8610, "Total Aromatics by Ultraviolet Absorption" was evaluated in conjunction with USEPA Method 3560, "Reverse Phase Cartridge Extraction" for the separation and qualitative determination of the presence or absence of visible or ultraviolet absorbing organic compounds listed in Appendix VIII of the Resource Conservation and Recovery Act (RCRA). A data base of the visible and ultraviolet (UV) spectral data was developed and used to estimate detection limits of Appendix VIII organic compounds which absorb UV or visible light in the region 220 to 700 nm. The reverse phase cartridge extraction procedure was evaluated for its ability to separate polar and nonpolar subsets of 21 Method 8610 analytes by the use of methanol and hexane eluents. The extraction procedure was found to be unsuitable for group separation in its present form, and needs further study to evaluate the behavior of individual analytes such as acids, bases, and polynuclear aromatic compounds. The spectrophotometric determinative technique of Method 8610 was found to be very sensitive for a majority of the compounds in the range of 220 to 400 nm, but requires further evaluation with a variety of groundwater extracts.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

18. DISTRIBUTION STATEMENT Release to public	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 124
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

NOTICE

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under Contract Number 68-03-1760 (Work Assignment 10) to the Battelle Memorial Institute, Battelle Columbus Division, Columbus, Ohio 43201. It has been subject to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

FOREWORD

Environmental measurements are required to determine the quality of ambient waters and the character of waste effluents. The Environmental Monitoring and Support Laboratory - Cincinnati, Ohio conducts research to:

- Develop and evaluate methods to measure the presence and concentration of physical, chemical, and radiological pollutants in water, wastewater, bottom sediments, and solid waste.
- Investigate methods for the concentration, recovery, and identification of viruses, bacteria and other microbiological organisms in water; and, to determine the responses of aquatic organisms to water quality.
- Develop and operate an Agency-wide quality assurance program to assure standardization and quality control of systems for monitoring water and wastewater.
- Develop and operate a computerized system for instrument automation leading to improved data collection, analysis, and quality control.

This report presents the results of the evaluation of U.S. EPA Method 3560, "Reverse Phase Cartridge Extraction for Polar and Nonpolar Aromatics" and U.S. EPA Method 8610, "Total Aromatics by Ultraviolet Absorption".

Robert L. Booth, Director
Environmental Monitoring and
Support Laboratory
Cincinnati-Ohio

ABSTRACT

U.S. EPA Method 8610, "Total Aromatics by Ultraviolet Absorption" was evaluated in conjunction with U.S. EPA Method 3560, "Reverse Phase Cartridge Extraction" for the separation and qualitative determination of the presence or absence of visible or ultraviolet absorbing organic compounds listed in Appendix VIII of the Resource Conservation and Recovery Act (RCRA). A data base of the visible and ultraviolet (UV) spectral data for these compounds was developed and used to estimate detection limits of Appendix VIII organic compounds which absorb UV or visible light in the region 220 to 700 nm. The reverse phase cartridge extraction procedure of Method 3560 was evaluated for its ability to separate polar and nonpolar subsets of 21 Method 8610 analytes by the use of methanol and hexane eluents. The extraction procedure was found to be unsuitable for group separation in its present form, and needs further study to evaluate the behavior of individual analytes such as acids, bases, and polynuclear aromatic compounds. The spectrophotometric determinative technique of Method 8610 was found to be very sensitive for a majority of the compounds in the range of 220 to 400 nm, but requires further evaluation with a variety of groundwater extracts to study the matrix effects of groundwater on the sensitivity of the method.

This report was submitted in partial fulfillment of Contract Number 68-03-1760, Work Assignment 10, by Battelle's Columbus Laboratories. The research reported here was conducted under the sponsorship of the U.S. Environmental Protection Agency.

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ACKNOWLEDGEMENT

The continuing support of the U.S. EPA Project Officer (Dr. Fred K. Kawahara) and the EPA staff members assisting in the planning of this study (Mr. James E. Longbottom and Dr. Denis L. Foerst) was instrumental in meeting the program goals and deadlines.

The technical participation of Hazel M. Burkholder; assistance with the literature and instrumental aspects of the program by Dr. Robert E. Schwerzel; the skilled editing of Karen S. Rush; and the manuscript preparation of M. Gayle Pakrosnis, Jean M. Greene, and Maria B. Dean, all of Battelle's Columbus Laboratories, are gratefully acknowledged.

SECTION 1

INTRODUCTION

The Environmental Protection Agency (EPA) has proposed an amendment (October 1, 1984 Federal Register) to its hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA) consisting of a hierarchical analysis procedure for groundwater testing. The proposed hierarchical procedure would allow hazardous waste facility operators to screen groundwater samples quickly for compounds of concern using relatively inexpensive methods, thus reducing their overall testing burden for regulated pollutants without jeopardizing environmental protection.

One of the proposed methods included in the hierarchical analysis protocol is U.S. EPA Method 8610, "Total Aromatics by Ultraviolet Absorption". When used in conjuction with U.S. EPA Method 3560, "Reverse Phase Cartridge Extraction", Method 8610 will allow operators of hazardous waste facilities to monitor groundwater beneath their facilities for a large number of regulated compounds and make decisions for advanced testing.

In an effort to evaluate the usefulness of Methods 3560 and 8610, EPA contracted Battelle's Columbus Laboratories, under Contract Number 68-03-1760, to conduct a research program to: (1) generate a data base of ultraviolet and visible spectral data for Method 8610 analytes; (2) evaluate Method 3560 for the collection and separation of polar and nonpolar Method 8610 analytes; and (3) evaluate Method 8610 for the analysis of total aromatic compounds.

SECTION 2

CONCLUSIONS

The data contained in this report on the evaluation of U.S. EPA Methods 3560 and 8610 for the extraction, separation, and qualitative estimation of the presence or absence of total aromatics support several important conclusions regarding the application of these methods:

- The reverse phase cartridge extraction procedure is unsuitable in its present form for the group separation of polar and nonpolar compounds. The modified elution procedure used in this work, however, was still not adequate to effect a clear polar/nonpolar compound separation. Although the polarities of the two elution solvents appear to be in the appropriate range for elution of these compounds from the reverse phase cartridges tested, the separation mechanism is influenced by other factors and is probably not a simple function of the analyte polarity.

- The cartridge extraction procedure does not retain all of the components of Method 8610, as evidenced by the apparent breakthrough of several of the compounds evaluated. Also, some nonpolar compounds require large volumes of hexane to elute completely from the cartridge.

- The UV spectrophotometric technique appears to be suitable for the analysis of methanol and hexane eluates from the reverse phase cartridges, but detection limits should not be estimated until a thorough evaluation of the matrix effects of representative groundwaters is made. After these effects are evaluated, it may be necessary to investigate alternative

determinative techniques such as spectrofluorometric methods or gas chromatography with specific detectors.

SECTION 3

RECOMMENDATIONS

Based upon the results of the tests conducted under this research program, the following recommendations are made:

- The reverse phase cartridge extraction procedure should be investigated further to evaluate the effect of pH on the extraction of acidic and basic compounds.

- A variety of reverse phase sorbents should be evaluated to determine the differences that may exist in selectivity and retention of the method analytes.

- The cartridge extraction procedure should be evaluated for losses of polynuclear aromatic hydrocarbons and related compounds from the aqueous sample onto the plastic components of the separation cartridge.

- U.S. EPA Method 8610 should be evaluated with a variety of groundwater samples to determine matrix effects on the UV/visible response, and to establish practical limits on absorbance differences between sample and reference solutions to refine detection limit estimates.

SECTION 4

EXPERIMENTAL

APPARATUS

The following equipment was employed in this research program.

Recording UV/VIS Spectrophotometer	Cary 14M, wavelength range 200-2600 nm; Cary 17 DX, wavelength range 186-3000 nm with expanded recorder range
Quartz cuvettes	1 cm^2, spectrosil quartz
Solid phase extraction system	Baker-10 SPE™ system; consisting of a vacuum manifold with removable sample rack
Disposable Octadecyl extraction cartridge	Baker-10 SPE™ disposable filtration cardridges, Octadecyl (C_{18}), 6 mL
Evaporation system	The Meyer N-trap Analytical Evaporator, Organonation Association, Inc.

REAGENTS

The following reagents and chemical supplies were used in this work.

Reagent Water	Tap water, purified with the Milli-Q water Purification system
Methanol	Burdick and Jackson grade, recommended for spectrophotometry
Hexane	Burdick and Jackson, UV grade

The suppliers and purity of the reference standards used in this study are presented in Table 1.

TABLE 1. SUMMARY OF REFERENCE STANDARDS PROCURED FOR U.S. EPA METHOD 8610 EVALUATION

Compound	CAS #	Supplier	Purity[a]
Nonpolar UV Compounds			
Benzene	71-43-2	Burdick & Jackson	Recommended for Spectrophotometry
Benzotrichloride	98-07-7	MC & B	NS[b]
Dibenzo[a,j]acridine	224-42-0	Sigma	Practical grade
m-Dichlorobenzene	541-73-1	Eastman	NS
Fluoranthene	206-44-0	Aldrich	98+%
Heptachlor	76-44-8	Chem Service	99+%
Methoxychlor	72-43-5	Sigma	Approximately 98%
Polychlorinated biphenyls (Arochlor 1242 and 1260)	1336-36-3	EPA	100%
Polar UV Compounds			
Acetophenone	98-86-2	MC & B	NS
5-(Aminomethyl)-3-isoxazolol hydrate	2763-96-4	Aldrich	98+%
Aniline	62-53-3	Aldrich	99.5+%
Butylbenzylphthalate	85-68-7	BCL Repository	NS
2-sec-Butyl-2,4-dinitrophenol	88-85-7	Sigma	NS

Footnotes appear on the following page. (continued)

TABLE 1. (Continued)

Compound	CAS #	Supplier	Purity(a)
Coal tar oil	8007-45-2	Chem Service	Tech
Creosote	8001-58-9	Chem Service	NS
Daunomycin·HCl	20830-81-3	Sigma	NS
Diallate	2303-16-4	EPA	99.6%
3,3'-Dichlorobenzidine	91-94-1	Sigma	(c)
2,4-Dichlorophenoxy-acetic acid	94-75-7	Chem Service	98%
2,4-Dimethylphenol	105-67-9	BCL Repository	NS
2,4-Dinitrophenol	51-28-5	BCL Repository	NS
2,6-Dinitrotoluene	606-20-2	BCL Repository	NS
1,2-Diphenylhydrazine	122-66-7	Aldrich	97%
Methylparathion	298-00-0	Chem Service	98%
1,4-Naphthoquinone	130-15-4	Chem Service	99+%
Phosphorothioic acid, O,O-Dimethyl-O-(p-((dimethyl amino)-sulfonyl) phenyl)ester	52-85-7	EPA	99.6%
Pyridine	110-86-1	Burdick & Jackson	Recommended for Spectrophotometry
Strychnine, NF	57-24-9	BCL Repository	NS
Thioacetamide	62-55-5	Chem Service	NS
2,4,6-Trichlorophenol	88-06-2	Chem Service	NS

(a) As given by supplier
(b) NS -- not specified by supplier
(c) This material is a free base purified from the dihydrochloride salt supplied by Sigma Chemical Co.

EVALUATION OF U.S. EPA METHOD 8610

The work completed under the evaluation of U.S. EPA Method 8610 was conducted in three segments: (1) acquisition of reference spectral data on both polar and nonpolar aromatic compounds and the development of a data base of this information; (2) the development of a subset of the method parameters of Method 8610 for the verification of the literature information, and for estimation of detection limits (EDL); and (3) acquisition of compounds for which no literature data was available, and the UV/visible spectral analysis of these compounds was needed to determine λ_{max}, absorptivity, and EDL.

Development of the UV and Visible Spectral Database

Both the physical and spectral data of the 90 polar and 39 nonpolar organic analytes listed in Method 8610 were entered into an IBM personal computer as a data base using the Lotus 1,2,3 software. The spectral information is presented in 10 nm windows to aid in the potential development of further refinements to the method. Files are stored on 5-1/4" floppy disks. For the analytes which consisted of a group of isomers, the physical and spectral data were searched for each individual isomer, with the exception of the polychlorinated biphenyls. Polychlorinated biphenyls include 209 individual isomers, and therefore, the literature search was directed only towards the thirteen common commercial formulations such as Aroclor 1242 or 1260.

Development of a Representative Subset of U.S. EPA Method 8610 Analytes

A subset of 21 of the 129 analytes from Method 8610 was selected by categorizing the compounds according to compound class or functional group, and choosing representative components from each group. An effort was made to choose the most representative components which encompass the range of polarities and absorption maxima of the total method analytes. Compound availability and, in some cases, compound solubility in methanol were also taken into consideration in making the final selection.

Verification of Spectral Data of Subset Compounds and Acquisition of Spectral Data on Compounds for Which no Spectral Data was Obtained

Data base verifications were accomplished by the analysis of the subset compounds described above, and the preparation and analysis of these compounds is described below under Method 3560 evaluations. Nine additional compounds were acquired from either the EPA repository or from commercial suppliers. These compounds included 2-sec-butyl-4,6-dinitrophenol, butylbenzylphthalate, coal tar, creosote, Daunomycin·HCl, Diallate, Aroclor 1242, Aroclor 1260, and Phosphorothioic acid; o-o-dimethyl-o-(p-(dimethylamino)-sulfonyl)phenyl ester. Stock solutions of these compounds were prepared in methanol for spectral acquisition and determination of λ_{max} and absorptivity as described below.

Evaluation of Detection Limit

A series solutions containing 0, 2.5, 5, 25 and 50 ppm of benzene in methanol were prepared. The UV spectra of these calibration solutions was acquired as described below versus a methanol solvent blank on both a Cary 14 and a Cary 17 scanning spectrophotometer. The Cary 17 data were acquired in the expanded absorbance range mode (0.00 to 0.10 absorbance units full scale).

EVALUATION OF U.S. EPA METHOD 3560

The reverse phase cartridge extraction procedure of U.S. EPA Method 3560 was evaluated with the subset of compounds chosen from the analyte list of U.S. EPA Method 8610. The extraction procedure was evaluated for elution solvent order and for effectiveness of the reverse phase cartridge cleanup and equilibration scheme. The subset compounds from Method 8610 were evaluated with the Method 3560 extraction procedure for elution characteristics and percent recovery when using a modified solvent elution order.

Evaluation of the Cartridge Cleanup Procedure

U.S. EPA Method 3560 was evaluated in this and all subsequent experiments using a "Baker-10" Solid Phase Extraction (SPE) system consisting of a vacuum manifold with removable sample rack, and disposable 6-mL Octadecyl (C_{18}) columns. Adequate vacuum for sample preparation was obtained from a water aspirator. A "T" joint was installed between the vacuum source and the trap with an air bleed valve to regulate the vacuum, and a three way stopcock connected between the trap and the manifold to release vacuum on the vacuum manifold conveniently.

Duplicate 6 mL disposable C_{18} columns were washed as specified in the method, first with 5 mL methanol, then with 10 mL reagent water. The liquid flow was controlled at 5 mL/min and the vacuum was disconnected before the solution had been totally aspirated through the column to prevent the column from drying. Two 50 mL portions of reagent water were then aspirated through the column at a rate of 5 mL/min. After the extraction columns were air dried under vacuum for 5 minutes and eluted with 5 mL of hexane followed by 5 mL of methanol, as described in Method 3560. All of the solvent washes and column eluates were collected and the absorbance in the 220 to 400 nm, was determined for each solvent as described below. The appropriate reagent solvent was used as the reference. All sample eluates were analyzed using 1.0 cm path length quartz sample cells.

After collection and initial UV scans of the eluates were completed, samples were concentrated to 2 mL using a stream of dry nitrogen on a water bath at 40°C. The concentrated eluates were again scanned from 220 to 400 nm against the concentrated reagent blank.

The column cleanup experiment was repeated with the elution solvent order reversed (i.e., methanol followed by hexane). All the eluates were collected and analyzed with the UV/scanning spectrophotometer as described below.

A Cary 14M Recording Spectrophotometer equipped with both deuterium and tungsten sources was used for collecting ultraviolet and visible spectra in this and subsequent experiments. The light intensity was kept constant using the variable slit mode over a range of 220 to 400 nm for the UV region

and 400 to 700 nm for the visible region. Data were collected at a scan speed of 2.5 nm/sec and recorded on chart paper using a two-pen recorder with ranges of 0-1 and 1-2 absorbance units, respectively.

Evaluation of Elution Characteristics and Recovery of Subset Compounds

The elution characteristics of the Method 8610 subset compounds were initially evaluated as two groups of compounds. After the group investigations, the subset compounds were evaluated individually for their elution profiles and recoveries from the reverse phase cartridge.

Preparation of the Composite Spiking Solutions--

In order to avoid possible interactions between the acidic components and amines, or between hydrazines and aldehydes or ketones, the subset of 21 compounds was divided into two groups. Group A consisted of 16 acidic or neutral components of the subset, and Group B consisted of the remaining five basic components. The compounds comprising Groups A and B are as follows:

Group A	Group B
acetophenone	aniline
butylbenzylphthalate	3,3'-dichlorobenzidine
(2,4-dichlorophenoxy)acetic acid (2,4-D)	1,2-diphenylhydrazine
2,4-dimethylphenol	pyridine
2,4-dinitrophenol	strychnine
2,6-dinitrotoluene	
methyl parathion	
1,4-naphthouquinone	
thioacetamide	
2,4,6-trichlorphenol	
benzene	
benzotrichloride	
m-dichlorobenzene	
heptachlor	
methoxychlor	
fluoranthene	

Both Group A and Group B compounds were prepared as composite standards in methanol at the 1.0 mg/mL level of each component with the exception of fluoranthene. Fluoranthene was prepared at the 0.1 mg/mL level. For the

liquid components, literature densities were used to compute the volumes of neat reagent required to prepare the solutions, while solid components were weighed on an analytical balance.

Preparation of Individual Spiking Solutions and UV Calibration Standards--

Individual stock solutions of each of the compounds listed in Groups A and B above, as well as compounds for which no spectral data was obtained, were prepared at concentrations of approximately 1000 ppm in reagent methanol. Dilutions were made using methanol to achieve the concentration levels used for spiking the reverse phase cartridges, for acquisition of UV spectra, and for preparing UV calibration standards. For the preparation of the 100 percent calibration standard, an aliquot of the diluted spiking solution equal to that used for spiking the reverse phase cartridge was placed in 5.0 mL of methanol and mixed.

Spiking of the reverse phase cartridges--"Baker-10" SPE disposable 6 mL cartridges containing octadecyl (C_{18}) packing were washed with 5 mL of hexane, 5 mL of methanol, and 10 mL of reagent water prior to spiking. The vacuum was then disconnected before the water had been totally aspirated through the cartridge. A 10-µL aliquot of the composite spiking solution was then placed at the top of the wet column. The vacuum was reconnected and the columns air dried for 10 minutes prior to column elution.

A second method of spiking was evaluated where the interstitial water in the cartridge after cartridge cleanup and equilibration was aspirated completely (but not to dryness) prior to spiking with 10 L of the composite spiking solution.

Elution of Spiked Cartridges--

Groups A and B--Group elution characteristics were evaluated after spiking, using the first spiking method onto the wet column (described above). After spiking and drying, the column was eluted with 5 mL of reagent water, 5 mL of methanol, and two successive 5 mL hexane fractions. All four fractions were collected in separate 4-dram vials equipped with Teflon-lined screw caps and stored until UV analysis (described above). The second

spiking method was also evaluated for Group A compounds. A second experiment was performed whereby the column was spiked after a cleanup procedure that used 50 mL of reagent water rather than the 10 mL recommended in the procedure.

Individual Subset Compounds--The individual subset compounds were spiked using the second spiking procedure (above) and eluted from the column using the same elution scheme as for Group A and B mixtures. Eluates were analyzed without concentration as described above. Determination of recovery was based upon a single point 100 percent recovery standard prepared in methanol and analyzed with the individual eluates.

SECTION 5

RESULTS AND DISCUSSION

DEVELOPMENT OF ULTRAVIOLET AND VISIBLE SPECTRAL DATABASE

The physical data for the polar and nonpolar aromatic compounds from U.S. EPA Method 8610 consists of the compound names, CAS registry numbers, synonyms, molecular weight, melting or boiling points, and solubility data. These data are presented in Table 2 for the polar compounds and in Table 3 for the nonpolar compounds. All listed data were obtained from either the Merck Index or the CRC Handbook of Chemistry and Physics.

The spectral data for the polar and nonpolar aromatic compounds consists of the compound name, CAS registry number, the solvent used for the spectrum acquisition, the λ_{max} wavelength and corresponding molar absorptivity and the reference from which the data was taken. These data are presented in Tables 4 and 5 for the polar and nonpolar compounds, respectively. In these tables, the spectral data for each compound is arranged in 26 columns of wavelength ranges of 10 nm each from 200 to 500 nm. This arrangement should be helpful in estimating UV cutoff ranges for the interpretation of actual sample results. Reference information is presented in the last column, where R1 corresponds to reference 1 in the list at the end of this report.

Since Greek characters were not available on the computer some characters were substituted with similar symbols available: "$\wedge$" was used to represent "λ", "a" was used to represent "α", "B" was used to represent "β", and "E" was used to represent "ε".

For the 90 polar components listed in Method 8610, at least two different literature sources of spectral data were found for 70 components. Only one literature reference was found for the following 13 components: 3-(α-acetonyl benzyl)-4-hydroxycoumarin, aramite, N,N-bis(2-chloroethyl)2-naphthylamine, chlorobenzilate, alpha,alpha-dimethylphenethylamine,

TABLE 2. PHYSICAL DATA OF UV ACTIVE NONPOLAR ORGANIC COMPOUNDS

I.D.#	COMPOUNDS	CAS.#	SYNONYMS	M.W.	B.P.	M.P.	SOLUBILITY DATA				
							Water	Alcohols	Aromatics	Nonpolars	a.a.
1	BENZ(c)ACRIDINE	225-51-4	3,4-BENZACRIDINE;a-CHRYSIDINE;a-NAPHTHACRIDINE;12-AZABENZ(a)ANTHRACENE	229.30							
2	BENZ(a)ANTHRACENE	56-55-3	1,2-BENZANTHRACENE;2,3-BENZOPHENANTHRENE;BENZANTHRENE;TETRAPHENE	228.30	435	162(167)	in	sl(h)	s	s	
3	BENZENE	71-43-2	BENZIN;BENZINE;BENZOL;BENZOLENE;PNENE;PHENYL HYDRIDE	78.10	80	6	sl	v		v	
4	BENZENE,DICHLOROMETHYL	98-87-3	a,a-DICHLOROTOLUENE;BENZAL CHLORIDE;BENZYL DICHLORIDE;BENZYLENE CHLORIDE	161.03	205		in	s		s	
5	BENZO(b)FLUORANTHENE	205-99-2	2,3-BENZFLUORANTHENE;3,4-BENZOFLUORANTHENE;BENZ(e)ACEPHENANTHRYLENE	252.30		168	in		sl		
6	BENZO(j)FLUORANTHENE	205-82-3	7,8-BENZOFLUORANTHENE;10,11-BENZOFLUORANTHENE;DIBENZO(a,j)FLUORENE	252.30		166	in	sl			sl
7	BENZO(a)PYRENE	50-32-8	1,2-BENZPYRENE;3,4-BENZPYRENE;6,7-BENZOPYRENE;3,4-BP	252.30	310-312	179	in	sl	s		
8	BENZOTRICHLORIDE	98-07-7	(TRICHLOROMETHYL)BENZENE;TOLUENE TRICHLORIDE;PHENYL CHLOROFORM	195.50	221	-5	in	s	s	s	
9	BENZYL CHLORIDE	100-44-7	(CHLOROMETHYL) BENZENE; a-CHLOROTOLUENE	126.60	179	-39	in	v		v	
10	4-BROMOPHENYL PHENYL ETHER	101-55-3	4-BROMODIPHENYL ETHER	249.10	310	19	in			s	
11	CHLORINATED BENZENES, N.O.S.										
11-1	CHLOROBENZENE	108-90-7	PHENYLCHLORIDE;BENZENE CHLORIDE;MONOCHLOROBENZENE	112.56	132		in	v	v	v	
11-2	1,2-DICHLOROBENZENE	95-50-1	o-DICHLOROBENZENE;CHLOROBEN;DILANTIN DB;DIZENE;DOWTHERME;DCB;ODB;ODCB	147.00	180	-17	in	s	v	v	
11-3	1,3-DICHLOROBENZENE	541-73-1	m-DICHLOROBENZENE	147.00	173	-25	in	s	s	v	
11-4	1,4-DICHLOROBENZENE	106-46-7	p-DICHLOROBENZENE;PARADOW;PARAMOTH;PARACIDE;DICHLORICIDE;SANTOCHLOR	147.00	174	53	in	v	s	s	
11-5	1,2,3-TRICHLOROBENZENE	87-61-6	BENZENE,1,2,3-TRICHLORO-	181.40	221		in	sl	v	s	
11-6	1,2,4-TRICHLOROBENZENE	120-82-1	UNSYM-TRICHLOROBENZENE	181.40	221		in	s	v	v	
11-7	1,3,5-TRICHLOROBENZENE	108-70-3	SYM-TRICHLOROBENZENE;s-TRICHLOROBENZENE	181.40	208		in	sl	v	v	s
11-8	1,2,3,4-TETRACHLOROBENZENE	634-66-2	BENZENE,1,2,3,4-TETRACHLORO-	215.90	254		in	s(h)		s	
11-9	1,2,3,5-TETRACHLOROBENZENE	634-90-2	1,2,4,6-TETRACHLOROBENZENE	215.90	246		s(h)	sl	s	s	
11-10	1,2,4,5-TETRACHLOROBENZENE	95-94-3	BENZENE,1,2,4,5-TETRACHLORO-	215.90	243-246		in	sl(h)	s	s	
11-11	PENTACHLOROBENZENE	608-93-5	BENZENE,PENTACHLORO-	250.30	277		in	sl(h)	s	s	
11-12	HEXACHLOROBENZENE	118-74-1	ANTICARIE;BUNT-CUVE;BUNT-NO-MORE;PERCHLOROBENZENE;JULIN'SCARBON CHLORIDE	284.80	323-326		in	sl	v	s	
12	2-CHLORONAPHTHALENE	91-58-7	B-CHLORONAPHTHALENE	162.60	256	61	in	s	s	s	
13	CHRYSENE	218-01-9	1,2-BENZOPHENANTHRENE;BENZO(a)PHENANTHRENE;1,2,5,6-DIBENZONAPHTHALENE	228.30	448	254	in	sl	sl	s(h)	s(h)
14	DDD	72-54-8	1,1'-DICHLORO,2,2'-bis(p-CHLOROPHENYL)ETHANE;ROTHANE;p,p'-TDE	320.10		109-110					
15	DDE	72-55-9	1,1-DICHLORO,2,2-bis(p-CHLOROPHENYL)ETHYLENE;DDT DEHYDROCHLORIDE	318.00							
16	DDT	50-29-3	1,1'-(2,2,2-TRICHLOROETHYLIDENE)bis[4-CHLOROBENZENE];PENTACHLORIN	354.50	260	109	in	sl	v	v	
17	DIBENZ(a,h)ACRIDINE	226-36-8	1,2,5,6-DIBENZACRIDINE;1,2,5,6-DINAPHTHACRIDINE	279.00							
18	DIBENZ(a,j)ACRIDINE	224-42-0	1,2,7,8-DIBENZACRIDINE;3,4,5,6-DIBENZACRIDINE;3,4,6,7-DINAPHTHACRIDINE	279.40							
19	DIBENZO(a,h)ANTHRACENE	53-70-3	1,2,5,6-DIBENZANTHRACENE;DB(a,h)A;1,2,5,6-DBA	278.40		266	in	sl	s		
20	7H-DIBENZO(c,g)CARBAZOLE	194-59-2	3,4,5,6-DIBENZCARBAZOL;3,4,5,6-DINAPHTHACARBAZOLE;7H-DB(cg)C	267.30							
21	DIBENZO(a,e)PYRENE	192-65-4	1,2,4,5-DIBENZOPYRENE;NAPHTHOLI1,2,3,4-def]CHRYSENE;DB(a,e)P	302.40		233-234		sl	sl	sl	sl
22	DIBENZO(a,h)PYRENE	189-64-0	1,2,6,7-DIBENZOPYRENE;3,4,8,9-DIBENZOPYRENE;DIBENZO[b,def]CHRYSENE	302.40							
23	DIBENZO(a,i)PYRENE	189-55-9	1,2,7,8-DIBENZOPYRENE;3,4,9,10-DIBENZPYRENE;BENZO(rst)PENTAPHENE	302.40							
24	1,2-DICHLOROBENZENE	95-50-1	o-DICHLOROBENZENE;CHLOROBEN;DILANTIN DB;DIZENE;DOWTHERME;DCB;ODB;ODCB	147.00	180	-17	in	s	v	v	
25	1,3-DICHLORODENZENE	541-73-1	m-DICHLOROBENZENE;	147.00	173	25	in	s	s	v	
26	1,4-DICHLOROBENZENE	106-46-7	p-DICHLOROBENZENE;PARADOW;PARAMOTH;PARACIDE;DICHLORICIDE;SANTOCHLOR	147.00	174	53	in	v	s	s	
27	DICHLOROBENZENE, N.O.S.	25321-22-6	DICHLORICIDE,PARAMOTH	147.00							
28	7,12-DIMETHYLBENZ(a)ANTHRACENE	57-97-6	7,10-DIMETHYL-1,2-BENZANTHRACENE;1,4-DIMETHYL,2,3-BENZPHENANTHRENE	256.30		122-123	in	sl	v	s	
29	FLUORANTHENE	206-44-0	1,2-BENZACENAPHTHENE;1,2-(1,8-NAPHTHLENE)BENZENE;BENZO(j,k)FLUORENE	202.30	384	111	in	s	s	s	s
30	HEPTACHLOR	76-44-8	'3,4,5,6,7,8,9-HEPTACHLORD DICYCLOPENTADIENE;HEPTAMUL;VESICOL	373.30		95-96	in	s	s	s	
31	HEXACHLOROBUTADIENE	87-68-3	PERCHLOROBUTADIENE;1,1,2,3,4,4-HEXACHLORO,1,3-BUTADIENE	260.80	215	-21	in	s		s	
32	HEXACHLOROCYCLOPENTADIENE	77-47-4	1,2,3,4,5,5-HEXACHLORO,1,3-CYCLOPENTADIENE;PERCHLOROCYCLOPENTADIENE	272.80	239	-9					
33	HEXACHLOROPHENE	70-30-4	2,2'-METHYLENE bis[3,4,6-TRICHLOROPHENOL];GRAMOPHEN;BILEVON	406.90		166-167	in	s	s	s	
34	INDENO-(1,2,3-cd)PYRENE	193-39-5	2,3-PHENYLENEPYRENE;2,3,0-PHENYLENEPYRENE	276.30							
35	METHOXYCHLOR	72-43-5	1,1'-(2,2,2-TRICHLOROETHYLIDENE)bis[4-METHOXYBENZENE];CHEMFORM;DMDT	345.70		94	in	s	v	v	
36	3-METHYLCHOLANTHRENE	56-49-5	1,2-DIHYDRO,3-METHYL-BENZ(j)ACEANTHRYLENE;20-METHYLCHOLANTHRENE	268.30		180	in	s(amyl-)	s		
37	NAPHTHALENE	91-20-3	NAPHTHENE;NAPHTHALIN;CAMPHOR TAR;WHITE TAR;MOTH BALLS	128.20	218	81	in	s	v	v(h)	
38	POLYCHLORINATED BIPHENYLS, N.O.S.	1336-36-3	AROCLOR;CHLOPHEN;PCBS;FENCLOR;CHLORODIPHENYLS;KANECHLOR								
39	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	TCDD;DIOXIN;2,3,6,7-TETRACHLORODIBENZODIOXIN;TCDBD	322.00		295					

a.a.-acetic acid, h-hot in-insoluble, s-soluble, sl-slightly, v-very

TABLE 3. PHYSICAL DATA OF UV ACTIVE POLAR ORGANIC COMPOUNDS

I.D.#	COMPOUNDS	CAS.#	SYNONYMS	M.W.	B.P.	M.P.	SOLUBILITY DATA				
							Water	Alcohols	Aromatics	Nonpolars	a.a.
1	ACETOPHENONE	98-86-2	ACETYL BENZENE;METHYL PHENYL KETONE;1-PHENYL ETHANOL	120.16	202		in	s			
2-a	3-(a-ACETONYLBENZYL)-4-HYDROXYCOUMARIN	81-81-2	WARFARIN;1-(4'-HYDROXY-3'-COUMARINYL)-1-PHENYL-3-BUTANONE	308.32			in	s			
2-b	3-(a-ACETONYL BENZYL)-4-HYDROXYCOUMARIN,SODIUM SALT	129-06-6	ATHROMBIN;SODIUM COUMADIN;WARFILONE;PROTHROMADIN;TINTORANE;WARAN	330.33			v	v			
3	2-ACETYLAMINOFLOURENE	53-96-3	N-2-FLUORENYLACETAMIDE;N-9HFLUOREN-2-YLACETAMIDE	223.26			in	s			
4	4-AMINOBIPHENYL	92-67-1	PHENYLANILINE;p-AMINODIPHENYL;1,1'-BIPHENYL-4-AMINE;XENYLAMINE	169.23	302		s(h)	v			
5	MITOMYCIN C	50-07-7	AMETYCINE;MUTAMYCIN;MMC	334.34			s	s		in	
6	5-(AMINOMETHYL)-3-ISOXAZOLOL	2763-96-4	MUSCIMOL;5-AMINOMETHYL-3-HYDROXYISOXAZOLE	114.10							
7	AMITROLE	61-82-5	3-AMINO-1H-1,2,3-TRIAZOLE;AMINOTRIAZOLE;AMIZOL;CYTROL;WEEDAZOL;ATA	84.08			v	v			
8	ANILINE	62-53-3	BENZENEAMINE;PHENYLAMINE;AMINOBENZENE;AMINOPHEN;KYANOL	93.12	184-186		S	V			
9	ARAMITE	140-57-8	ACARACIDE;BUTYLPHENOXY ISOPROPYLCHLOROETHYLSULFITE;ORTHO-MITE	334.87	200-210		in				
10	AURAMINE	492-80-8	APYONIN;BIS(p-DIMETHYLAMINOPHENYL)METHYLENEIMINE;	267.38		136	in	s		sl	
11	BENZENETHIOL	108-98-5	THIOPHENOL;PHENYLMERCAPTAN;MERCAPTOBENZENE	110.17	169		in	v	v	v	
12	BENZIDINE	92-87-5	P-DIAMINODIPHENYL;[1,1'-BIPHENYL]-4,4'-DIAMINE	184.23	400		v(h)	s			
13	1,4-BENZOQUINONE	106-51-4	2,5-CYCLOHEXADIENE-1,4-DIONE;p-QUINONE;1,4-BENZOQUINONE	108.09	(sub)		s(h)	s			
14	N,N-BIS(2-CHLOROETHYL)-2-NAPHTHYLAMINE	494-03-1	DICHLOROETHYL-B-NAPHTHYLAMINE;B-NAPHTHYLDI(2-CHLOROETHYL)AMINE;ERYSAN	268.20							
15	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	1,2-BENZENEDICARBOXYLIC ACID,BIS(2-ETHYLHEXYL)ESTER	390.54							
16	BRUCINE	357-57-3	2,3-DIMETHOXYSTRYCHNIDIN-10-ONE;10,11-DIMETHOXYSTRYCHNINE	394.45			s(h)	v			
17	BUTYL BENZYL PHTHALATE	85-68-7	PHTHALIC ACID,BENZYL BUTYL ESTER;PALATINOL BB;SANTICIZER 160	312.39							
18	2-Sec-BUTYL-4,6-DINITROPHENOL;(DNBP)	88-85-7	2-(1-METHYLPROPYL)-4,6-DINITROPHENOL	240.22		38-42		s	s	s	
19	CHLORAMBUCIL	305-03-3	4-[BIS(2-CHLOROETHYL)AMINO]BENZENE BUTANOIC ACID;CHLORAMINOPHEN;LEUKERAN	304.23		64-66				s	
20	p-CHLOROANILINE	106-47-8	4-CHLOROANILINE;4-CHLOROBENZENEAMINE	127.57	232		s(h)	v			
21	CHLOROBENZILATE	510-15-6	4-CHLORO-a-(4-CHLOROPHENYL)-a-HYDROXYBENZENE ACETIC ACID,ETHYL ESTER	325.20			s(h)				
22	p-CHLORO-o-CRESOL	59-50-7	4-CHLORO-3-METHYLPHENOL;CHLOROCRESOL;2-CHLORO-5-HYDROXY TOLUENE	142.58	235		v	s			
23	2-CHLOROPHENOL	95-57-8	O-CHLOROPHENOL	128.56	175		v	s	v	s	
24	CITRUS RED NO. 2	6358-53-8	1-(2,5-DIMETHOXYPHENYLAZO)-2-NAPHTHOL;CI SOLVENT RED 80(12156)	308.34		155-157	sl	s			
25	COAL TAR	8007-45-2	CRUDE COAL TAR				sl	s(partly)	s	s(partly)	
26	CREOSOTE	8001-58-9	A MIXTURE OF PHENOLS FROM WOOD TAR		203-220		s	v			
27	CRESOLS	1319-77-3	CRESYLIC ACIDS	108.13	195-205		s	v			
28	2,4-DINITRO-6-CYCLOHEXYLPHENOL	131-89-5	6-CYCLOHEXYL-4,6-DINITROPHENOL;2,4-DINITRO-6-CYCLOHEXYLPHENOL;DNOCHP	266.25			s				
29	DAUNOMYCIN	20830-81-3	DAUNORUBICIN;RUBIDOMYCIN;ACETYLADRIAMYCIN;LEUKAEMOMYCIN C;CERUBIDIN	527.57							
30	DIALLATE	2303-16-4	2-PROPENE-1-THIOL,2,3-DICHLORO DIISOPROPYLCARBAMATE;AVADEX;DATC	270.24	150		s				
31	DI-n-BUTYL PHTHALATE	84-74-2	1,2-BENZENEDICARBOXYLIC ACID DIBUTYL ESTER;PHTHALIC ACID,DIBUTYL ESTER	278.34	340		s	v			
32	3,3'-DICHLOROBENZIDINE	91-94-1	o,o'-DICHLOROBENZIDINE;4,4'-DIAMINO-3,3'-DICHLORODIPHENYL;DCB	253.13			in	v			
33	2,4-DICHLOROPHENOL	120-83-2	PHENOL,2,4-DICHLORO	163.00	145		sl	s			
34	2,6-DICHLOROPHENOL	87-65-0	phenol,2,6-dichloro	163.00	219		sl	v	s	v	
35	2,4-DICHLOROPHENOXYACETIC ACID	94-75-7	2,4-D;HEDONAL;TRINOXOL	221.04	160		in	s			
36	O,O'-DIETHYLPHOSPHORIC ACID,O-p-NITROPHENYL ESTER	311-45-5	DIETHYL p-NITROPHENYL PHOSPHATE;ETHYL PARAOXON;NIOTISAL	275.22			in				
37	DIETHYL PHTHALATE	84-66-2	1,2-BENZENEDICARBOXYLIC ACID,DIETHYL ESTER;NEANTINE;PHTHALOL;SOLVANOL	222.24	302		in	v	s	v	
38	DIETHYLSTILBESTROL	56-53-1	4,4'-DIHYDROXYDIETHYL STILBENE;a,a'-DIETHYL STILBENEDIOL;STILBESTROL	268.34			in	s			
39	DIHYDROSAFROLE	94-58-6	DIHYDRO-4-ALLYL-1,2-METHYLLENEDIOXYBENZENE;5-PROPYL-1,3-BENZODIOXOLE	164.22							
40	3,4-DIHYDROXY-a-(METHYLAMINO)METHYL BENZYL ALCOHOL	51-43-4	[1-(3,4-DIHYDROXYPHENYL)-2-METHYLAMINO] ETHANOL;EPINEPHRINE;ADRIN	183.20			sl	in			
41	3,3'-DIMETHOXYBENZIDINE	119-90-4	3,3'-DIMETHOXY-(1,1'-BIPHENYL)4,4'-DIAMINE;DIANISIDINE;BLUE BASE NB	244.28		136	in	s			
42	p-DIMETHYLAMINOAZOBENZENE	60-11-7	N,N-DIMETHYL-4-(PHENYLAZO)BENZENAMINE;METHYL YELLOW;BUTTER YELLOW	225.28		118	in	s			
43	3,3'-DIMETHYLBENZIDINE	119-93-7	3,3'-DIMETHYL [1,1'-BIPHENYL] 4,4'-DIAMINE;o-TOLIDINE	212.28			sl	v			
44	a,a-DIMETHYLPHENETHYLAMINE	122-09-8	a-BENZYLISOPROPYLAMINE;PHENYL-tert-BUTYLAMINE;PHENTERMINE	149.23	205						
45	2,4-DIMETHYLPHENOL	105-67-9	2,4-DIMETHYL-1-HYDROXY-BENZENE;XYLENOL	122.16	210		sl	v		v	
46	DIMETHYL PHTHALATE	131-11-3	1,2-BENZENEDICARBOXYLIC ACID,DIMETHYL ESTER;PALATINOL M;FERMINE;DMP	194.19	283		in	v		v	v
47	DINITROBENZENE, N.O.S.	------									
47-a	1,2-DINITROBENZENE		o-DINITROBENZENE	168.11	319		in	s,v(h)	s	v	
47-b	1,3-DINITROBENZENE		m-DINITROBENZENE	168.11	291		sl(h)	v(h)	v	v	
47-c	1,4-DINITROBENZENE		p-DINITROBENZENE	168.11	299		in	sl	s	s	
48	4,6-DINITRO-o-CRESOL	534-52-1	3,5-DINITRO-2-HYDROXYTOLUENE;3,5-DINITRO-o-CRESOL;DINITROL;DETAL;DN	198.13			sl	v		v	
49	2,4-DINITROPHENOL	51-28-5	a-DINITROPHENOL;ALDIFEN	184.11	(sub)		sl	s	s	s	
50	2,4-DINITROTOLUENE	121-14-2	2,4-DINITRO METHYL BENZENE	182.14	300		in	s			

TABLE 3. CONTINUED

I.D.#	COMPOUNDS	CAS.#	SYNONYMS	M.W.	B.P.	M.P.	SOLUBILITY DATA				
							Water	Alcohols	Aromatics	Nonpolars	a.a.
51	2,6-DINITROTOLUENE	606-20-2	1,3-DINITRO 2-METHYL BENZENE	182.14				s			
52	DI-n-OCTYL PHTHALATE	117-84-0	1,2-BENZENEDICARBOXYLIC ACID,BIS(2-ETHYLHEXYL)ESTER;OCTOIL	390.54	255-265						
53	DIPHENYLAMINE	122-39-4	N-PHENYLBENZENEAMINE	169.22	302		in	s	v	v	
54	1,2-DIPHENYLHYDRAZINE	122-66-7	HYDROAZOBENZENE;N,N'-BIANILINE;sym-DIPHENYLHYDRAZINE	184.24				v			
55	ISOSAFROLE	120-58-1	3,4-METHYLENEDIOXY-1-PROPENYL BENZENE;4-PROPENYLCATECHOL METHLENE ETHER	162.18	253			v	v	v	
56	MALEIC HYDRAZIDE	123-33-1	1,2-DIHYDRO-3,6-PYRIDAZINEDIONE;3,6-DIOXO-1,2,3,6-TETRAHYDRO PYRIDAZINE	112.10			sl	sl(h)			
57	METHAPYRILENE	91-80-5	2-[(2-DIMETHYLAMINO ETHYL)2-THENYLAMINO PYRIDINE;THENYL PYRAMINE	261.38	173-175						
58	4,4'-METHYLENEBIS(2-CHLOROANILINE)	101-14-4		267.17		110	sl	s		s	s
59	METHYL PARATHION	298-00-0	O,O-DIMETHYL-O-p-NITROPHENYL THIOPHOSPHATE;DIMETHYL PARATHION;METRON	263.23			s	s	s	s	
60	1,4-NAPHTHOQUINONE	130-15-4	1,4-DIHYDRO-1,4-DIKETONAPHTHALENE;1,4-NAPHTHALENEDIONE;a-NAPHTHOQUINONE	158.15			sl	sl(h)	v	v	v
61	1-NAPHTHYLAMINE	134-32-7	1-AMINONAPHTHALENE;1-NAPHTHALENAMINE;a-NAPHTHYL AMINE;NAPHTHALIDINE	143.18	300		sl	v		v	
62	2-NAPHTHYLAMINE	91-59-8	2-AMINONAPHTHALENE;2-NATHALENAMINE;B-NAPHTHYLAMINE	143.18	306	111-113	s,v(h)	s		s	
63	NICOTINE	54-11-5	1-METHYL-2-(3-PYRIDYL)PYRROLIDINE;dl-TETRAHYDRONICOTYRINE;PYRROLIDINE	162.23	245		v	v		v	
64	4-NITROANILINE	100-01-6	4-NITROBENZENEAMINE;1-AMINO-4-NITRO BENZENE	138.13	332		in	s	sl	s	
65	NITROBENZENE	98-95-3	NITROBENZOL;ESSENCE OF MIRBANE;OIL OF MIRBANE	123.11	211		sl	v	v	v	
66	4-NITROPHENOL	100-02-7		139.11	279		sl	v	sl	v	
67	PARATHION	56-38-2	O,O-DIETHYL O-p-NITROPHENYL PHOSPHOROTHIOATE;ETILON;PARAPHOS;NIRAN	291.27	375		in	v	v	v	
68	PENTACHLORONITROBENZENE	82-68-8	PCNB;QUINTOZENE;FOLOSAN;TERRACHLOR;AVICOL;BRASSICOL;BOTRILEX	295.36	328		in	sl	v	v	
69	PENTACHLOROPHENOL	87-86-5	PENTA;PCP;PENCHLOROL;SANTOPHEN 20	266.35	309		in	v	s	v	
70	PHENACETIN	62-44-2	ACETOPHENETIDIN;p-ACETOPHENETIDIDE;p-ETHOXY ACETANILIDE;FENIDINA	179.21	(dec)	137-138	sl	s	sl	sl	
71	PHENYLENEDIAMINES	------									
71-a	o-PHENYLENEDIAMINE	95-54-5	2-AMINOANILINE;1,2-BENZENEDIAMINE;1,2-DIAMINOBENZENE	108.14	256		s(h)	v		v	
71-b	m-PHENYLENEDIAMINE	108-45-2	3-AMINOANILINE;1,3-BENZENEDIAMINE;DEVELOPER C	108.14	282		v	v			
71-c	p-PHENYLENEDIAMINE	106-50-3	p-DIAMINOANILINE;p-BENZENEDIAMINE;BENZOFUR D	108.14	267		sl	s(h)		s	
72	N-PHENYLTHIOUREA	103-85-5	PHENYLTHIOUREA;PHENYLTHIOCARBAMIDE;1-PHENYL-2-THIOUREA	152.22		154	s(h)	s			
73	PHOSPHOROTHIOIC ACID,O,O-DIMETHYL-O-(p-((DIMETHYL-AMINO)-SULFONYL)PHENYL) ESTER	52-85-7	FAMOPHOS;O,O-DIMETHYL-o,p-(DIMETHYL SULFAMOLY)PHENYL PHOSPHOROTHIOATE	325.36		53					
74	PHTHALIC ACID ESTERS, N.O.S.	------									
74-a	BUTYL BENZYL PHTHALATE	(see 017)									
74-b	BIS(2-ETHYLHEXYL)PHTHALATE	(see 015)									
74-c	DI-n-BUTYL PHTHALATE	(see 031)									
74-d	DIETHYL PHTHALATE	(see 037)									
74-e	DIMETHYL PHTHALATE	(see 046)									
74-f	DI-n-OCTYL PHTHALATE	(see 052)									
75	PHTHALIC ANHYDRIDE	85-44-9	1,3-ISOBENZOFURANDIONE;PHTHALANDIONE	148.12	(sub)		sl	s	s(h)	s	
76	2-PICOLINE	109-06-8	2-METHYLPYRIDINE	93.13	128		v	v		v	
77	PROPYLTHIOURACIL	51-52-5	6-PROPYL-2-THIOURACIL;2-THIO-4-OXO-6-PROPYL-1,3-PYRIMIDINE	170.24		219-220	sl	s	in	in	
78	PYRIDINE	110-86-1	AZINE	79.10	116		s	s	s	s	
79	RESERPINE	50-55-5	3,4,5-TRIMETHOXYBENZOYL METHYL RESERPATE;ALSERIN;SANDRIL;SERPEN	608.70		264-265	sl(h)	s(h)	s	sl	
80	RESORCINOL	108-46-3	1,3-BENZENEDIOL;m-DIHYDROXYBENZENE;RESORCIN	110.11	178		s	s		sl	
81	SAFROLE	94-59-7	4-ALLYL-1,2-METHYLENEDIOXYBENZENE;ALLYLCATECHOL METHYLENE ETHER	162.19	234	11	in	v		v	
82	STRYCHNINE	57-24-9	STRYCHNIDIN-10-ONE;STRYCHNOS;SAMASEED;CERTOX	334.42	270		sl(h)	sl	sl	sl	
83	THIOACETAMIDE	62-55-5	ETHANETHIOAMIDE;TAA;THIACETAMIDE	75.14		115-116	s	v		sl	
84	2,4,5-TRICHLOROPHENOL	95-95-4	COLLUNOSOL;DOWICIDE 2	197.45	253		sl	s	s	s	
85	2,4,6-TRICHLOROPHENOL	88-06-2	ONAL;DOWICIDE 2S	197.46	246		sl	s	s	sl	s(h)
86	2,4,5-TRICHLOROPHENOXY ACETIC ACID (2,4,5-T)	93-76-5	TRIOXONE;WEEDONE	255.49		157-158	in	s(h)	v(h)		
87	2,4,5-TRICHLOROPHENOXYPROPIONIC ACID (2,4,5-TP)	93-72-1	SILVEX;2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID;FENOPROP	269.35		182	sl	s	sl	sl	
88	SYM-TRINITROBENZENE	99-35-4	1,3,5-TRINITROBENZENE;BENZITE	213.11	315	121-122	sl(h)	sl	s	sl	
89	TRYPAN BLUE	72-57-1	TETRASODIUM,3,3'-[(3,3'-DIMETHYL 4,4'-DIPHENYLENE)BIS(AZO)BIS (5-AMINO-4-HYDROXY-2,7-NAPHTHALENEDISULFONATE)	960.83			s	in			
90	URACIL MUSTARD	66-75-1	5-[BIS(2-CHLOROETHYL)AMINO]2,4-(1H,3H)PYRIMIDINEDIONE;DIMETHYLDOPAN	252.10	(dec)		sl				

a.a.-acetic acid, dec-decomposes, in-insoluble, s-soluble, sl-slightly, sub-sublimes, v-very

TABLE 4. SPECTRAL DATA OF UV ACTIVE POLAR ORGANIC COMPOUNDS

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				(200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309n
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE1
1	ACETOPHENONE	98-86-2	CYCLOHEXANE											
			CYCLOHEXANE				235 3.72		255 2.56		279 2.66	286 2.61		
			CYCLOHEXANE				238 4.10				277 2.95			
			CYCLOHEXANE				239 4.00							
			CYCLOHEXANE				237 4.10				277 2.95			
			DICHLOROETHANE								275 3.00			
			DIOXAN				238 4.00							
			DIOXAN				239 4.10				277 3.00			
			DIOXAN					241 4.07			279 3.03	288 2.99		
			ETOH					242 4.10			279 3.02			
			ETOH					242 4.10				288 3.00		
			ETOH					242 4.00			279 3.02			
			ETOH					242 4.00			279 3.03			
			ETOH					244 4.20			278 3.00			
			ETOH					240 4.10				281 2.95		
			ETOH					243 4.10						
			ETOH	280 3.97				241 4.05			279 2.94	284 2.90		
			ETOH					242 4.10			279 3.02			
			ETOH					244 4.26			278 3.04			
			ETOH					242 4.10			277 3.00			
			n-HEPTANE				238 4.12				278 2.95	286 2.85		
			n-HEPTANE				235 4.16							
			n-HEPTANE				238 4.10				279 2.95			
			HEXANE				237 4.11					285 2.96		
			HEXANE				237 4.11				277 3.00	286 2.90		
			HEXANE								278 3.04			
			HEXANE				238 4.10							
			HEXANE				238 4.13				278 2.95			
			HEXANE				239 4.10				277 2.95	285 2.94		
			ISOOCTANE				238 4.11				279 2.94			
			ISOOCTANE				237 4.11				277 3.00	286 2.90		
			ISOOCTANE				239 4.00				278 2.93	286 2.86		
			40% ISOPrOH					245 4.10				290 3.00		
			MeOH					242 4.00				290 3.00		
			MeOH					242 4.07				290 3.30		
			MeOH					240 4.12						
			H2O					246 4.06						
			H2O					244 4.00			277 3.09			
			H2O					246 4.06			278 3.00			
			H2O					249 4.04				290 3.06		
			H2O					249 4.04				290 3.06		
2-a	3-(α-ACETONYLBENZYL)-4-HYDROXYCOUMARIN	81-81-2	H2O,pH10											308 4.41
2-b	WARFARIN,SODIUM SALT	129-06-6	(to be determined)											
3	2-ACETYLAMINOFLUORENE	53-96-3	CYCLOHEXANE									290 4.60		
			ETOH									287 4.40		300 4.21
			ETOH								278 4.42	290 4.46		305 4.26
			ETOH									287 4.40		305 4.21
			MeOH									290 4.57		
4	4-AMINOBIPHENYL	92-67-1	ETOH									280 4.20		
			ETOH								278 4.27			

(Continued)

TABLE 4. SPECTRAL DATA OF UV ACTIVE POLAR ORGANIC COMPOUNDS

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
	323 1.60														
315 1.94															87-16-87
															87-7-162
															87-5-136
															87-4-162
															87-3-151
															87-6-162
															87-3-151
															87-4-162
318 1.70															87-15-103
															87-17-86
312 1.00															87-15-103
															87-12-100
															87-2-134
315 2.60															87-2-134
	329 2.51														87-13-100
															87-13-100
310 1.02															87-7-162
319 1.70															87-3-151
	321 1.70														87-5-136
															87-1-189,190
	329 1.60														87-2-134
	329 1.61														87-11-104
	329 1.60														87-3-151
	325 1.70														87-1-189,190
															87-1-189,190
															87-16-87
	321 1.61														87-4-162
	321 1.64														87-12-100
318 1.64															87-5-136
		335 1.69													87-13-100
															87-3-151
															87-1-189,190
	320 1.90														87-7162
															87-1-189,190
															87-5-136
															87-4-162
															87-5-136
															87-4-162
		332 1.70													87-1-189,190
		333 1.69													87-1-189,190
															87-3-151
															89-9852
317 4.52															
															87-18-411
314 4.17															87-2-441
313 4.20															87-1-612
314 4.48															87-1-612
															87-18-411
															87-6-400
															87-8-241

(Continued)

TABLE 4. Continued

				UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
I.D.#	COMPOUND	CAS. No.	Solvent	*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE1
			EtOH									290 4.28		
			EtOH									280 4.24		
			EtOH								275 4.20			
			EtOH								278 4.36			
			MeOH								278 4.31			
5	MITOMYCIN C	50-07-7	MeOH		216 4.39									
			MeOH		217 4.39									
			MeOH											
			H2O											
6	5-AMINOMETHYL-3-ISOXAZOLOL	2763-96-4	(to be determined)											
7	AMITROLE	61-82-5	EtOH	207 3.78										
			MeOH		218 3.34									
8	ANILINE	62-53-3	ALKANE				234 3.95					288 3.27		
			BENZENE										290 3.30	
			CYCLOHEXANE				234 3.95					288 3.30		
			CYCLOHEXANE				234 3.95					288 3.27		
			CYCLOHEXANE	201 --			234 3.95					287 3.30		
			CYCLOHEXANE				234 4.00					287 3.29		
			DIOXAN				235 4.14					285 3.35		
			DIOXAN				235 3.95					285 3.17		
			ETHER				238 4.00					288 3.28		
			ETHER				233 3.93					286 2.26		
			EtOH				235 3.90					286 3.18		
			EtOH				236 3.96					287 3.28		
			n-HEPTANE				230 3.90					286 3.20		
			HEXANE				235 3.99						290 3.26	
			HEXANE				235 4.02					289 3.37		
			ISOOCTANE									288 3.28		
			ISOOCTANE				234 3.96					284 3.24	288 3.28	
			ISOOCTANE				230 3.98					288 3.25		
			MeOH				230 3.93							
			H2O				231 3.89					288 3.12		
			H2O									288 3.16		
			HCONH2										290 3.30	
9	ARAMITE	140-57-8	HEXANE	195 2.94		225 2.21					275 0.42	283 0.37		
10	AURAMINE	492-80-8	HOAc								278 3.48			
			HOAc						255 3.30					
11	BENZENETHIOL	108-98-5	ALCOHOL				237 3.85							
			CYCLOHEXANE			220 4.10					278 3.80			
			CYCLOHEXANE	205 4.26			236 3.94					290 2.82		
			DIOXAN					241 3.82				286 2.80		
			ETHER				237 3.84				282 2.77	295 2.55		
			EtOH	205 4.20			237 3.92				279 2.92			
			SIEtOH	202 4.20			236 3.81			262 3.30				
			HEXANE				238 3.92				273 2.82	291 2.81	299 2.64	
			ISOOCTANE				236 3.93				272 2.81	280 2.84		
			MeOH			220 4.04				266 2.70				
12	BENZIDINE	92-87-5	ALCOHOL									287 4.40		
			EtOH									286 4.40		
			EtOH									285 4.40		
			EtOH									284 4.42		

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
															87-8-241
															87-17-248
															87-2-383
															87-2-383
															81-10845
					340 4.39										89-6079
					340 4.36										87-6-617
				357 4.36											87-7-616
					347 4.34										87-7-616
															87-19-2
															87-13-3
															87-14-37
															87-5-44
															87-16-37
															87-15-45
															87-14-37
															81-3695
															87-12-43
															87-14-37
															87-4-76,77
															87-3-68
															87-15-45
															87-14-37
															87-2-63,64
															87-10-55
															87-14-37
															87-4-76
															87-3-68
															87-3-68
															87-11-44
															87-10-36
															87-4-76
															87-7-76
															811-54(5)-1040
						372 3.54							440 3.74		88-a1473
316 2.50						372 3.30							441 3.70		87-5-565
															88-6854
															87-14-36
															87-15-44
															87-8-47
															87-8-43
															87-15-44
															87-15-44
															87-13-48
															87-1-92
															87-14-36
															88-b2261
															87-1-457
															87-1-457
															87-8-245

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE11
			EtOH											
			H2O		210 4.40									
13	1,4-BENZODIOXONE	106-51-4	ALCOHOL									287 4.40		
			BENZENE					242 4.26				284 4.39		
			DIBROMOMETHANE									285 2.60		
			CHLOROFORM											
			CHLOROFORM										290 3.03	
			CYCLOHEXANE					246 4.42						300 3.00
			ETHER					245 4.30				288 2.50		
			ETHER					240 4.11				280 2.70		
			HEPTANE										290 3.18	
			HEXANE					241 4.30						
			HEXANE								277 2.53			
			PET. ETHER				235 4.30					280 2.54		
			PET. ETHER					248 4.20						
			CCl4						250 4.70					300 2.30
			CCl4						250 4.20					300 3.00
			CS2						250 4.17			282 2.51		
			EtOH									282 2.51		
			EtOH				232 3.98	243 4.09						
			H2O					242 4.26					293 3.16	
			H2O						250 4.70			285 2.60		
14	N,N-BIS(2-CHLOROETHYL)-2-NAPHTHYLAMINE	494-03-1	DIOXANE					245 4.40						300 2.50
			H2O					243 4.32					295 2.70	
15	BIS(2-ETHYL HEXYL)PHTHALATE	117-81-7	EtOH						254 4.73			286 4.19	297 4.05	
			EtOH			224 3.86								
16	BRUCINE	357-57-3	EtOH			227 3.86					272 3.10	278 3.05		
			EtOH								276 3.19			
			EtOH							263 4.09				
			DIOXANE							264 4.01				301 3.93
17	BUTYL BENZYL PHTHALATE	85-68-7	TOLUENE							264 4.01				301 3.94
18	2-sec-BUTYL-2,4-DINITROPHENOL	88-85-7	(to be determined)							264 4.00				302 3.86
19	CHLORAMBUCIL	305-03-3	(to be determined)											302 3.90
			H2O											
20	4-CHLOROANILINE	106-47-8	CHLOROFORM						259 4.20					
			ALCOHOL						250 4.18					302 3.32
			CYCLOHEXANE					242 3.90						306 3.36
			CYCLOHEXANE					242 4.00					295 3.20	
			CYCLOHEXANE					243 4.10					299 3.30	
			EtOH					241 3.95				291 3.11	297 3.28	304 3.11
			EtOH					244 3.38					298 3.20	
			EtOH				239 4.07						298 3.09	
			EtOH					240 4.04					290 3.18	
			EtOH					244 4.10						300 3.26
			HEXANE					242 3.90						
			HEXANE					241 4.10					295 3.20	
			H2O											
21	CHLOROBENZILATE	510-15-6	H2O				239 4.02					294 3.36		
22	p-CHLORO-m-CRESOL	59-50-7	EtOH				239 3.95					292 3.11		
			BUTANOL	205 4.48		225 4.31						290 3.23		
			DIOXANE							266 2.89				

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
															R7-3-345
															R1-6632
													434 1.26	454 1.22	RB-b2069
													430 1.50		R7-2-50
															R7-18-30
													430 1.50		R7-2-50
												439 1.35			R7-4-57,58
															R7-3-56
							385 3.20								R7-18-30
														580 1.47	R7-3-56
															R7-16-29
															R7-3-56
													476 1.24		R7-3-56
													450 1.10		R7-2-50
												430 1.50			R7-2-50
													450 1.30		R7-2-50
												432 1.34	454 1.22		R7-4-57,58
													450 1.40		R7-10-44
															R7-18-30
												434 1.26	454 1.22		R7-4-57,58
										410 1.50					R7-2-50
											425 1.40				R7-3-56
												435 1.26			R7-7-61
				390 3.45											R2-7-1174
															R7-9-789
															R2-2876
															R9-1426
															R7-1-964
															R7-1-964
															R7-3-909
															R2-1501
															R2-1501
															RB-a1048
															R7-16-32
															R7-5-57
															R7-1-85
															R7-15-39
															R7-5-57
															R7-6-68
															R7-3-61
															R7-1-85
															R7-3-61
															R7-1-85
															R7-18-33
															R7-1-85
															R7-17-472
														645 4.48	R7-13-72

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA (200-209nm) ^1 LogE1	(210-219nm) ^2 LogE2	(220-229nm) ^3 LogE3	(230-239nm) ^4 LogE4	(240-249nm) ^5 LogE5	(250-259nm) ^6 LogE6	(260-269nm) ^7 LogE7	(270-279nm) ^8 LogE8	(280-289nm) ^9 LogE9	(290-299nm) ^10 LogE10	(300-309 ^11 LogE
			CYCLOHEXANE									281 3.33	289 3.28	
			EtOH-BORATE											
			MeOH			227 3.92						281 3.29		
			n.s.q.									282 3.23		
23	2-CHLOROPHENOL	95-57-8	ALCOHOL		216 3.81						274 3.37	280 3.30		
			CYCLOHEXANE		212 3.81									
			CYCLOHEXANE		212 3.81					268 3.19	274 3.37	281 3.39		
			CYCLOHEXANE									281 3.39		
			DIOXAN								277 3.18	284 3.29	290 3.20	
			ETHER		217 3.79									
			EtOH								278 3.38			
			H2O								273 3.35			
			H2O								279 3.16			
			n.s.q.			227 3.93						282 3.23		
24	CITRUS RED NO. 2	6358-53-8	EtOH											
			HOAc											
25	COAL TAR	8007-45-2	(to be determined)											
26	CREOSOTE	8001-58-9	(to be determined)											
27	CRESOLS	1319-77-3	(see 27a,27b,27c)											
27-a	o-CRESOL	95-48-7	CYCLOHEXANE		213 3.85					270 3.27	276 3.24			
			DIOXAN								274 3.35	280 3.30		
			EtOH								273 3.28			
			EtOH								275 3.32			
			EtOH								274 3.30			
			SOLEtOH								276 3.26			
			HEXANE								272 3.30	278 3.30		
			ISOOCTANE								272 3.30	278 3.29		
			ISOOCTANE							272 3.26	276 3.25			
			MeOH		209 3.71						275 3.22			
			MeOH								274 3.29			
			MeOH		214 3.78						272 3.26			
27-b	m-CRESOL	108-39-4	CYCLOHEXANE									280 3.24		
			DIOXAN								275 3.27	282 3.23		
			EtOH								276 3.34			
			EtOH								274 3.27			
			EtOH								274 3.23			
			HEXANE		214 3.79					271 3.20	277 3.27			
			HEXANE							271 3.30	279 3.30			
			ISOOCTANE							272 3.22	279 3.26			
			ISOOCTANE						267 3.10	272 3.20	279 3.30			
			MeOH								274 3.24			
			MeOH							273 3.20				
27-c	p-CRESOL	106-44-5	CYCLOHEXANE									280 3.23		
			CYCLOHEXANE									280 3.32		
			DIOXAN									282 3.35	288 3.26	
			DIOXAN									282 3.35	288 3.26	
			DMF									282 3.34		
			EtOH			227 3.90						280 3.40	288 3.40	
			EtOH			224 3.83						280 3.24		
			HEXANE									286 3.32		
			HEXANE								280 3.40	286 3.40		

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
															B7-7-110
														605 4.22	B7-13-72
															B1-1303
															B7-16-55
															B8-p613
															B7-5-51
															B7-5-51
															B1-2864
															B7-10-45
															B7-5-51
															B7-1-76,77
															B7-8-37
															B7-13-41
															B7-16-30
315 3.88										415 --				516 4.32	B7-13-671
314 3.91										413 --				521 4.35	B7-13-671
															B7-4-124
															B7-15-75
															B7-2-105
															B7-1-150,151
															B7-1-150,151
															B7-3-110
															B7-5-105
															B7-2-105
															B7-1-150,151
															B8-t498
															B7-11-76
															B1-259
															B7-11-76
															B7-10-84
															B7-1-150,151
															B7-1-150,151
															B7-2-105
															B8-t499
															B7-5-105
															B7-1-150,151
															B7-2-105
															B7-11-76
															B1-2338
															B8-t500
															B7-11-76
															B7-15-75
															B7-10-59
															B7-7-12
															B7-1-150,151
															B7-1-150,151
															B7-11-76
															B7-5-105

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA (<200-209nm ^1 LogE1)	(210-219nm ^2 LogE2)	(220-229nm ^3 LogE3)	(230-239nm ^4 LogE4)	(240-249nm ^5 LogE5)	(250-259nm ^6 LogE6)	(260-269nm ^7 LogE7)	(270-279nm ^8 LogE8)	(280-289nm ^9 LogE9)	(290-299nm ^10 LogE10)	(300-309n ^11 LogE1
			ISOOCTANE			221 3.76			265 2.90	268 3.02	276 3.27	280 3.33	282 3.10	286 3.31
			ISOOCTANE							273 3.30	278 3.40	286 3.30		
			MeOH									280 3.29		
			MeOH			228 3.76					279 3.28			
			MeOH								279 3.28			
28	2,4-DINITRO-6-CYCLOHEXYLPHENOL	131-89-5	(to be determined)											
29	DAUNOMYCIN	20830-81-3	(to be determined)											
30	DIALLATE	2303-16-4	(to be determined)											
31	DI-n-BUTYL PHTHALATE	84-74-2	ALCOHOL			226 3.98					272 3.18			
			EtOH			226 3.98					272 3.18			
			EtOH								275 3.09			
			EtOH			228 3.90					276 3.10	283 3.10		
			MeOH			224 3.90					274 3.09			
32	3,3'-DICHLOROBENZIDINE	91-94-1	CYCLOHEXANE									282 4.37		
			EtOH									286 4.40		
			MeOH									294 4.76		
33	2,4-DICHLOROPHENOL	120-83-2	DIOXAN									286 3.44		
			ETHER									287 4.00		
			H2O									284 3.32		
			n.s.q									286 3.40		
34	2,4-DICHLOROPHENOL	87-65-0	DIOXAN								278 3.43			
			EtOH			222 3.90						282 3.30	290 3.30	
			H2O								276 3.29			
			MeOH										292 3.45	299 3.44
35	2,4-DICHLOROPHENOXYACETIC ACID	94-75-7	HEXANE,acid									284 3.30	294 3.20	
			MeOH				230 3.98					285 4.35		
36	O,O'-DIETHYLPHOSPHORIC ACID, O-p-NITROPHENYL ESTER	311-45-5	--								274 3.94			
37	DIETHYL PHTHALATE	84-66-2	ALCOHOL			227 3.90					275 3.10			
			EtOH								275 3.08			
			EtOH			225 3.90					275 3.10			
			EtOH			227 3.90					275 3.10			
			--			224 3.92					274 3.10			
38	DIETHYLSTILBESTROL	56-53-1	EtOH				236 4.20					290 3.60		
			EtOH					240 4.22			270 3.70			
			EtOH				239 4.26				279 3.85			
			MeOH				233 3.94	240 4.02	250 4.12	260 3.98		290 3.74		
			MeOH				239 4.23							
39	DIHYDROSAFROLE	94-58-6	EtOH									288 --		
			EtOH				234 3.60					287 3.57		
			HEXANE									286 3.45		
			ISOOCTANE				235 3.60					288 3.58		
			MeOH				234 3.68					287 3.67		
40	3,4-DIHYDROXY-a-(METHYLAMINO) METHYL BENZYL ALCOHOL	51-43-4	H2O										290 2.90	
			H2O										290 2.90	
			PH7			220 3.81						280 3.43		
41	3,3'-DIMETHOXYBENZIDINE	119-90-4	CYCLOHEXANE											308 4.1
			MeOH		212 4.7									303 4.2
42	p-DIMETHYLAMINOAZOBENZENE	60-11-7	BENZENE											

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
															R7-1-150,151
															R7-1-150,151
															R7-11-76
															R7-1-150,151
															R1-833
															R8-p817
															R7-2-508
															R7-1-701
															R7-1-701
															R1-01902
															R7-10-299
															R7-2-295
															R1-015430
															R7-10-42
															R7-1-72
															R7-13-39
															R7-16-28
															R7-10-42
															R7-3-53
															R7-13-39
															P1-9
															R7-1-173
															R1-013141
															R8-b1028
															R7-1-471
															R7-1-471
															R7-2-319
															R1-0375
															R7-2-571
															R7-1-776
															R7-1-776
															R7-1-776
															R1-03809
															R7-7-208
															R7-3-254
															R7-2-225
															R7-3-254
															R7-9-196
															R8-a744
															R7-2-188
															R7-6-243
															R7-10-438
															R1-06317
										410 4.45					R7-2-413

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(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309r
				^1 LogE1	^2 LogE2	^3 LogE3	^4 LogE4	^5 LogE5	^6 LogE6	^7 LogE7	^8 LogE8	^9 LogE9	^10 LogE10	^11 LogE
			CHLOROFORM							265 4.00				305 3.60
			CYCLOHEXANE						250 4.02					
			CYCLOHEXANE											
			CYCLOHEXANE											
			CYCLOHEXANE											
			CYCLOHEXANE						253 4.00	261 3.98				302 3.60
			CYCLOHEXANE						253 4.02					
			DIOXAN						255 4.04					
			ETHYLENE CHLORIDE											
			ETHYLENE CHLORIDE							260 4.00				
			ETHER											
			EtOH											
			EtOH											
			EtOH											
			EtOH											
			EtOH						255 3.98					
			EtOH											
			EtOH						254 4.03					305 3.7(
			EtOH											
			EtOH											
			EtOH						253 4.00					
			EtOH											
			EtOH											
			EtOH						250 4.10					
			EtOH											
			50%EtOH											
			95%EtOH											
			EtOH-HCl											
			EtOH-HCl											
			EtOH-HCl											
			EtOH-HCl											
			HEXANE						254 4.04					
			ISOOCTANE						253 4.00					
			MeCN											
			MeCN											
			MeOH						257 3.91					
			MeOH						255 3.99					
43	3,3'-DIMETHYLBENZIDINE	119-93-7	ALCOHOL								270 3.95			
			EtOH									284 4.40		
			EtOH									285 4.30		
			MeOH									284 4.40		
44	a,a-DIMETHYLPHENETHYLAMINE	122-09-8	CYCLOHEXANE									282 4.37		
45	2,4-DIMETHYLPHENOL	105-67-9	BUSP04							268 2.30		287 2.02		
			CYCLOHEXANE											
			CYCLOHEXANE									280 3.31		
			EtOH									280 3.31		
			ISOOCTANE									280 3.33		
												280 3.28		

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
										410 4.43					R7-2-413
									401 4.40						R7-10-435
								390 4.49							R7-16-392
								390 4.49							R7-18-365
									400 4.48						R7-15-473
									401 4.48						R7-6-546
314 3.60	326 3.55								400 4.49		420 4.25			450 3.56	R7-13-454
									400 4.48						R7-13-454
313 3.61															R1-0347
									407 4.41						R7-10-435
										410 4.46					R7-8-330
310 3.61										412 4.47					R7-6-546
									402 4.49						R7-6-546
									404 4.49						R7-16-392
										412 4.44					R7-15-473
									408 4.44						R7-4-519
										410 4.44					R7-4-519
									405 4.45						R7-5-423
									408 4.44						R7-5-423
									408 4.44						R7-7-541
											420 4.38				R7-7-541
									407 4.45						R7-6-546
										410 4.43					R7-2-413
										410 4.50					R7-2-413
										410 4.45					R7-3-468
										410 4.50					R7-3-468
											420 4.47				R7-3-468
											420 4.38				R7-2-413
														456 4.46	R7-2-413
	322 3.93													514 4.35	R7-14-406
														520 4.33	R7-15-473
319 4.05														521 4.57	R7-6-546
														510 4.62	R7-3-468
								398 4.38						465 3.42	R7-18-365
								398 4.47							R7-2-413
	325 3.60									410 4.48					R7-7-541
										410 4.46					R7-8-330
									404 4.48						R7-10-435
312 3.64									407 4.44				440 4.28		R7-13-454
															RR-b7264
															R7-2-415
															R7-1-581
															P1-86379
															J1-810948
	320 3.46														R7-2-146
															RR-b682
															P7-4-179
															R7-1-211
															R7-1-211

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(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA											
				<200-209nm		210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
				^1	LogE1	^2 LogE2	^3 LogE3	^4 LogE4	^5 LogE5	^6 LogE6	^7 LogE7	^8 LogE8	^9 LogE9	^10 LogE10	^11 LogE11
			MeOH										281 3.33		
			MeOH											292 3.65	
			[illegible]						240 3.91					298 3.56	
46	DIMETHYL PHTHALATE	131-11-3	ALCOHOL				225 3.92					274 3.10			
			EtOH				225 3.92					274 3.10			
			EtOH									277 3.05			
			ISOOCTANE				224 3.93					275 3.06	281 3.04		
47	DINITROBENZENE,N.O.S.	--------													
47a	1,2-DINITROBENZENE	528-29-0	(to be determined)												
47b	1,3-DINITROBENZENE	99-65-0	ALCOHOL						242 4.21						305 3.04
			CYCLOHEXANE				228 4.30								
			CYCLOHEXANE				228 4.31					275 3.04	283 3.00	294 2.89	
			CYCLOHEXANE				228 4.32								
			EtOH					235 4.24							
			EtOH							250 4.20					300 3.10
			EtOH					234 4.25							
			EtOH					233 4.24							
			EtOH						242 4.21						305 3.04
			5%EtOH						242 4.22						
			HEXANE				228 4.29								
			H2O						242 4.20						
			H2O						244 4.19						
			H2O						242 4.21						305 3.04
			PENTANE				227 4.32								
			MeOH					234 4.23							
47c	1,4-DINITROBENZENE	100-25-4	ALCOHOL								266 4.16				
			CYCLOHEXANE							255 4.30					
			EtOH								260 4.11				
			EtOH								260 4.14				
			EtOH								260 4.14				
			EtOH							258 4.17					
			EtOH								266 4.16				
			EtOH								260 4.11				
			5%EtOH								265 4.16				
			HEXANE							256 4.13					
			MeOH							258 4.17					
			MeOH							258 4.17					
48	4,6-DINITRO-O-CRESOL	534-52-1	DIOXAN								265 5.15				
			MeEtCO												
			MeOH								263 4.14				
			MeOH-NaOH												
49	2,4-DINITROPHENOL	51-28-5	BENZENE												
			CYCLOHEXANE							256 4.19					
			DIOXAN							257 5.14					
			EtOAc								260 3.91		280 3.76		
			EtOAc								260 3.91		280 3.76		
			EtOH							253 4.01				293 3.96	
			EtOH											292 3.96	
			EtOH							253 4.01				292 3.96	

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
															R7-11-113
															R1-0521
															R7-11-113
															BB-p824
															R7-4-282
															R9-3250
															R7-1-323
															BB-b726
															R7-8-35
															R7-4-56
															R7-4-56
															R7-1-72
															R7-1-72
		330 2.50													R7-5-48
															R7-4-56
															R7-4-56
															R7-4-56
															R7-5-48
															R7-5-48
															R7-4-56
															R7-1-72
															R7-1-72
															R7-6-60
															BB-b727
															R7-8-35
															R7-6-60
															R7-6-60
															R7-6-60
															R7-5-49
															R7-4-56
															R7-4-56
															R7-4-56
															R7-4-56
															R7-5-49
															R7-2-48
															R7-14-54
												430 3.83			R7-2-89
															R1-810554
						371 4.22			403 3.83						R7-5-87
		335 3.49													R7-6-61
		335 3.53						390 3.80							R7-8-35
															R7-14-30
															R7-2-48
															BB-p845
		330 3.60													R7-6-61
															R7-1-72
															R7-1-72

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA (200-209nm *1 LogE1	210-219nm *2 LogE2	220-229nm *3 LogE3	230-239nm *4 LogE4	240-249nm *5 LogE5	250-259nm *6 LogE6	260-269nm *7 LogE7	270-279nm *8 LogE8	280-289nm *9 LogE9	290-299nm *10 LogE10	300-309nm *11 LogE1
			EtOH						252 3.99				294 3.94	
			HEXANE						256 4.23		270 4.08			
			3ACN			222 4.04				260 3.94				
			MeOH		212 4.09				257 4.06				292 3.99	
			MeOH						254 4.06					
			20%MeOH		212 4.01					261 4.09			294 3.97	
50	2,4-DINITROTOLUENE	121-14-2	5%ALCOHOL						252 4.15					
			CYCLOHEXANE				234 4.14							
			EtOH					240 4.15						
			5%EtOH						252 4.15					
			50%MeOH-KCN											
			o.s.g.					242 4.16						
			PENTANE				232 4.20							
51	2,6-DINITROTOLUENE	606-20-2	5%ALCOHOL					241 3.95						
			MeOH				232 3.99							
52	DI-n-OCTYL PHTHALATE	117-84-0	CYCLOHEXANE									287 2.96		
			EtOH			227 3.92					276 3.11			
53	DIPHENYLAMINE	122-39-4	CHLOROFORM										290 4.23	
			CYCLOHEXANE									281 3.92		
			CYCLOHEXANE				236 3.65					287 4.22	292 4.16	
			CYCLOHEXANE									292 4.24		
			CYCLOHEXANE									285 4.30		
			DIOXAN				235 3.75					285 4.33		
			DIOXAN				235 3.75					285 4.33		
			EtOH	207 --								284 4.33		
			EtOH									285 4.31		
			EtOH									285 4.23		
			EtOH									285 4.31		
			EtOH	200 4.48			237 3.72					284 4.38		
			WATER	208 4.3								284 4.29		
			EtOH									285 4.30		
			EtOH					240 3.67				284 4.24		
			HEXANE								278 4.30			
			MeOH									281 4.20		
54	1,2-DIPHENYLHYDRAZINE	122-66-7	ALCOHOL					245 4.30					290 3.60	
55	ISOSAFROLE(cis)	120-58-1	96%ALCOHOL						259 4.00				296 3.64	
	ISOSAFROLE(trans)	120-58-1	96%ALCOHOL						260 4.08	267 4.06				305 3.72
	ISOSAFROLE	120-58-1	n-HEXANE							264 4.19				303 3.82
56	MALEIC HYDRAZIDE	123-33-1	EtOH											
			H2O	206 4.14										304 3.28
			MeOH											
			MeSO3H											
57	METHAPYRILENE	91-80-5	EtOH					240 4.23				282 3.48		305 3.60
			H2O				238 4.17							304 3.60
			H2O				238 4.17							304 3.60
58	4,4'-METHYLENEBIS(2-CHLOROANILINE)	101-14-4	MeOH					247 4.27						
59	METHYL PARATHION	298-00-0	MeOH								272 3.90			
60	1,4-NAPHTHOQUINONE	130-15-4	ALCOHOL						255 4.20					
			BENZENE											

(Continued)

TABLE 4. Continued

310-319nm	320 -329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
								396 3.29							R7-15-35
		335 3.46													R7-13-40
					362 4.10				400 4.00						R7-6-61
			340 3.51												R7-8-35
															R1-011646
				350 3.50											R7-8-35
															R8-t479
															R1-09596
															R7-1-128
															R7-4-106
									400 3.26						R7-19-38
															R7-3-96
															R7-1-128
															R8-t481
															R1-017370
															R1-0675
															R2-16-123,124
															R7-11-288
															R1-868
															R7-11-288
															R7-12-297
															R7-6-400
															R7-14-286
															R7-12-297
															R7-14-286
															R7-12-297
															R7-3-340
															R7-13-320
															R7-13-320
															R7-2-303
															R7-6-400
															R7-11-288
															R7-5-311
															R7-11-288
			340 2.80												R8-k669
															R9-5072
															R9-5072
															R7-2-213
310 3.42															R7-12-10
310 3.40															R7-14-8
															R1-07221
															R7-12-10
															R7-2-423
															R8-a378
															R7-1-588
															R1-010631
															R1-011044
		330 3.40													R8-n390
									400 1.70		422 1.70				R7-5-200

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA (200-209nm ^1 LogE1)	(210-219nm ^2 LogE2)	(220-229nm ^3 LogE3)	(230-239nm ^4 LogE4)	(240-249nm ^5 LogE5)	(250-259nm ^6 LogE6)	(260-269nm ^7 LogE7)	(270-279nm ^8 LogE8)	(280-289nm ^9 LogE9)	(290-299nm ^10 LogE10)	(300-309nm ^11 LogE11)
			CCl4											
			CHLOROFORM							262 4.00				
			CHLOROFORM					245 4.34	257 4.12					
			CHLOROFORM											
			CHLOROFORM					246 4.28	256 4.13					
			CHLOROFORM						255 4.20					
			DIOXAN											
			DIOXAN					245 4.30						
			DIOXAN											
			DIOXAN					245 4.22						
			EtOH					249 4.30						
			EtOH					246 4.34	251 4.34	260 4.05				
			EtOH						253 4.20					
			EtOH					246 4.37						
			H2O					246 4.28	256 4.13					
			ISOOCTANE					247 4.27	252 4.29					
			MeOH						250 4.30					
			MeCN						250 4.60					
61	1-NAPHTHYLAMINE	134-32-7	ALCOHOL					246 4.31	250 4.30					
			CYCLOHEXANE					242 4.27						
			CYCLOHEXANE					243 4.44						
			EtOH					245 4.60						305 3.90
			EtOH					242 4.27						
			EtOH					240 4.40						
			EtOH				239 4.30							
			EtOH					240 4.30						
			EtOH					240 4.36						
			ETHYLENE CHLORIDE											
			HEPTANE					245 4.48						
			HEXANE											
			H2O					240 4.48						
62	2-NAPHTHYLAMINE	91-59-8	ALCOHOL				234 4.78							303 3.52
			CYCLOHEXANE				236 4.78					280 3.82	292 3.73	
			CYCLOHEXANE				237 4.78					280 3.85		
			CYCLOHEXANE?		220 4.90			241 4.80				285 4.30		
			ETHER								270 3.70	280 3.80		
			EtOH				237 4.40					280 3.70		
			EtOH				234 4.78					280 3.82	292 3.73	
			EtOH				236 4.71				272 3.70	280 3.78	290 3.65	
			EtOH								278 3.50			
			EtOH				235 4.70					280 3.80		
			HEXANE					240 4.70				280 3.80	290 3.70	
			HEXANE				231 5.25				278 3.80	280 3.80	291 3.70	
63	NICOTINE	54-11-5	ALCOHOL								275 4.01	282 3.90		
			CYCLOHEXANE							262 3.47				
			EtOH						256 3.39					
			EtOH							262 3.47				
			EtOH							262 3.46				
			EtOH							260 3.50				
										262 3.46				

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
		330 3.50													R7-4-252
		335 3.48													R7-10-184
		335 3.48													R7-17-147
		334 3.44									420 2.70				R7-2-197
				350 3.50											R7-2-197
		335 3.50													R7-5-200
		330 3.44													R7-2-197
									400 1.70	419 1.70					R7-5-200
		330 3.43								413 1.67					R7-11-170
	327 3.50														R7-1-294
		330 3.50													R7-1-294
		330 3.40													R7-4-252
		330 3.44													R7-3-222
		334 3.44													R7-15-186
			341 3.53											450 2.20	R7-16-153
		330 3.40													R7-1-294
		330 3.80													R7-1-294
		330 3.48													R7-7-251
	330 3.71														98-n36
318 3.71															R1-89508
	320 3.90	335 3.80													R7-4-268
	320 3.71														R7-4-268
	320 3.70														R7-7-264
318 3.70															R7-2-205
	325 3.70														R7-1-311
	322 3.71														R7-1-311
	323 3.70														R7-1-311
	320 3.79														R7-12-184
310 3.72															R7-15-198
312 4.00															R7-4-270
	325 3.43														R7-1-311
			340 3.28												98-n38
		334 3.37													R1-846
			340 3.90												R7-14-175
			340 3.30												R7-4-268
			345 3.30												R7-4-268
			340 3.28												R7-4-268
			340 3.32												R7-4-268
		339 3.20													R7-1-312
			340 3.50												R7-1-312
				350 3.30											R7-1-312
	330 3.30	335 3.30	240 3.40	350 3.30											R7-4-271
		335 3.59													R7-4-271
															98-n471
															R1-81355
															R7-4-298
															R7-11-204
															R7-1-348
															R7-1-348

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE11
			EtOH											
			EtOH-HCl							260 3.45				
			H2O							260 3.70				
			H2O							260 3.43				
			H2O							260 3.48				
			PET. ETHER							260 3.48				
44	4-NITROANILINE	100-01-6	ALCOHOL							261 3.34				
			BENZENE			227 3.86								
			BENZENE			226 3.90								
			CYCLOHEXANE											
			CYCLOHEXANE			227 3.89								
			CYCLOHEXANE			226 3.85	231 3.84							
			DIOXAN			227 4.04								
			DIOXAN					240 --						
			DIOXAN											300 --
			DIOXAN											
			DIOXAN											
			ETHER											
			EtOH				230 3.83							
			EtOH			229 3.90								
			EtOH				231 4.22							
			EtOH			229 3.82					274 3.69			
			EtOH			227 3.86								
			EtOH				230 4.02							
			EtOH			229 3.70								
			EtOH							260 3.30			295 3.20	
			EtOH			227 3.56								
			EtOH				230 3.83							
			EtOH											
			EtOH			227 3.86								
			HEPTANE			226 3.90								
			HEXANE											
			HEXANE											
			HEXANE			226 4.00								
			HEXANE			226 3.86								
			H2O											
			H2O				230 3.70							
			H2O			226 3.83								
			H2O											
			H2O			223 3.70								
			H2O			226 3.83								
			H2O											

(Continued)

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TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
															R7-5-234
															R7-5-234
															R7-5-234
															R7-1-348
															R7-1-348
	321 4.17					375 4.19									R7-1-348
			345 4.20												R8-a1170
	324 4.34														R7-7-71
	322 4.17														R7-7-34
	322 4.19														R7-7-71
	323 4.11														R7-15-41
															R7-17-34
						375 4.41									R7-17-34
						370 4.18									R7-10-50
				353 4.20											R7-19-24
				354 4.12											R7-9-39
				352 4.50											R7-7-71
			348 4.21												R7-17-34
						376 4.20									R7-7-71
						372 4.23									R7-15-41
						372 4.18									R7-6-70
									403 3.72						R7-4-70
						376 4.19									R7-4-70
						375 4.19									R7-3-42
					368 4.18										R7-5-58
						375 4.19									R7-5-58
						375 4.20									R7-5-58
						371 4.20									R7-1-87
						375 4.18									R7-1-87
						374 4.20									R7-1-87
						376 4.20									R7-1-87
						374 4.23									R7-9-39
						375 4.20									R7-9-39
						375 4.19									R7-2-59
9 4.18						376 4.19									R7-4-69
	320 4.15														R7-4-69
				355 4.18											R7-4-69
	320 4.20														R7-4-69
	320 4.16														R7-1-87
	320 4.48														R7-5-58
															R7-17-34
							381 4.09								R7-17-34
							380 4.00								R7-8-41
							382 4.14								R7-1-87
						375 4.11									R7-18-34
						378 4.16									R7-4-69
							381 4.13								R7-5-58
							380 4.13								R7-5-58
															R7-2-59

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309r
				^1 LogE1	^2 LogE2	^3 LogE3	^4 LogE4	^5 LogE5	^6 LogE6	^7 LogE7	^8 LogE8	^9 LogE9	^10 LogE10	^11 LogE1
			MeCN											
			MeOH			227 3.32								
			MeOH				230 3.83							
			MeOH											300 --
			MeOH											
			PET. ETHER											
			PET. ETHER											
45	NITROBENZENE	98-95-3	ALCOHOL							260 3.91				
			CYCLOHEXANE						252 3.95			285 3.18		
			CYCLOHEXANE	209 3.97					253 3.95					
			CYCLOHEXANE						251 3.97			287 3.08		
			CYCLOHEXANE						252 3.92		278 3.32	288 3.09	298 2.71	
			CYCLOHEXANE						252 3.95			285 3.18		
			CYCLOHEXANE						253 3.94					
			CYCLOHEXANE						253 3.95					
			DIOXAN						250 3.91					
			DIOXAN							260 3.95				
			DIOXAN						250 3.91					
			ETHER						256 3.93					
			EtOH						251 3.95					
			EtOH							260 3.92			297 3.18	
			EtOH							260 3.92				300 3.00
			EtOH							260 3.90				
			EtOH							261 3.80				
			EtOH		212 3.83					260 3.91				
			EtOH							260 3.91				
			EtOH							260 3.92				
			EtOH							260 3.90				
			EtOH							260 3.91				
			EtOH							260 3.90				
			EtOH							260 3.90				
			EtOH							260 4.10				
			HEPTANE							260 3.92				
			HEPTANE						251 3.95					
			HEPTANE	206 4.11					252 3.48			280 3.10		
			HEXANE			223 4.01			251 3.90					
			HEXANE						251 3.95					
			HEXANE						252 3.95					
			HEXANE						252 3.93			285 3.19	295 2.85	
			n-HEXANE						251 3.95					
			n-HEXANE						254 3.93					
			H2O						251 3.98					
			H2O							260 3.89				
			H2O							268 3.91				
			H2O							267 3.84				
			H2O							266 3.90				
			ISOOCTANE								270 3.89			
			ISOOCTANE						253 3.90					
			ISOOCTANE						252 3.93					

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
					362 4.52										R7-17-34
					360 4.20										R1-08451
						370 4.12									R7-19-24
						371 4.20									R7-7-71
	320 4.16														R7-7-71
	320 4.16														R7-2-59
															R7-2-59
															R8-0891
															R7-4-63
			345 2.09												R7-4-65
															R7-15-37
															R7-11-37
															R7-3-58
															R7-7-64
															R7-5-53
															R7-3-58
															R7-7-64
															R7-4-63
															R7-5-54
			344 2.24												R7-13-42
															R7-15-37
															R7-18-32
		333 2.30													R7-1-78
															R7-1-78
															R7-4-65
															R7-4-65
															R7-5-54
															R7-2-53
															R7-2-53
															R7-3-58
															R7-3-58
															R7-7-64
															R7-4-63
															R7-4-63
															R7-4-63
															R7-5-54
															R7-5-53
															R7-5-53
															R7-17-29
															R7-3-58
															R7-3-58
															R7-2-53
															R7-17-29
															R7-5-54
															R7-4-63
															R7-4-63
															R7-1-78
															R7-1-78
															R7-1-78

(Continued)

TABLE 4. Continued

				UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309n
I.D.#	COMPOUND	CAS. No.	Solvent	*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE1
			ISOOCTANE						251 3.95					
			ISOOCTANE						251 3.95					
			MeOH							260 3.91				
			MeOH							260 3.91				
			MeOH						253 3.89					
			MeOH							260 3.89				
			MeOH							260 3.93				
			PET. ETHER						251 3.96					
			PET. ETHER						251 3.96					
			PET. ETHER						255 4.00					
AA	4-NITROPHENOL	100-02-7	ACETONE											300 2.50
			BENZENE											301 4.04
			CCl4										292 4.34	
			CHLOROFORM											
			CYCLOHEXANE									287 4.17		
			CYCLOHEXANE										295 4.04	
			CYCLOHEXANE									286 4.03		
			CYCLOHEXANE									286 3.96		
			CYCLOHEXANE									287 4.09		
			DIOXAN											301 3.96
			DIOXAN											304 4.05
			DIOXAN											304 4.07
			DIOXAN						256 4.94					307 5.04
			ETHER											307 4.18
			ETHER										299 4.06	
			EtOH			225 3.85								
			EtOH											
			EtOH											
			EtOH											
			EtOH			228 3.70								
			EtOH											
			EtOH			225 3.85								
			EtOH											
			EtOH			225 3.85								
			EtOH			225 3.85								
			EtOH											
			HEPTANE									285 4.02		
			HEXANE		219 3.99								296 4.00	
			HEXANE			224 3.96						286 4.03		
			HEXANE		219 3.98	226 3.90						285 4.01		
			HEXANE			225 3.78							290 3.90	
			HEXANE									288 3.89		
			HEXANE			222 3.91								306 4.01
			H2O			226 3.84								
			H2O			226 3.90								
			H2O											
			H2O			226 4.01								
			H2O											
			H2O											

(Continued)

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TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^12 LogE12	^13 LogE13	^14 LogE1'	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
															R7-3-58
															R7-4-63
															R7-4-63
															R7-4-65
															R7-10-45
															R7-7-64
															R7-5-54
															R7-2-53
			340 2.00												R7-2-53
310 4.09															R7-2-53
															R7-4-65
															R7-17-29
															R7-17-29
														710 0.70	R7-16-30
															R7-17-29
															R7-4-65
															R7-5-54
															R7-10-46
															R7-7-64
															R7-7-64
															R7-4-65
															R7-17-29
															R7-14-32
															R7-17-29
312 4.02															R7-5-55
314 4.03															R7-11-37
314 4.11															R7-16-30
314 4.06															R7-4-65
310 3.80															R7-7-64
314 4.11															R7-2-55
312 4.03															R7-2-55
314 4.11															R7-6-66
314 4.11															R7-5-55
312 4.02															R7-5-55
314 4.11															R7-1-80
															R7-1-80
															R7-4-65
			340 2.55												R7-15-37
															R7-13-42
															R7-8-38
															R7-1-80
318 4.00															R7-7-64
	320 4.00														R7-5-54
318 4.00															R7-5-54
314 4.13															R7-6-66
	320 3.74														R7-1-80
314 3.98										407 3.96					R7-7-64
															R7-2-55
															R7-4-65

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE11
			H2O											
			MeOH			226 3.88								
			MeOH											
			MeOH											
			MeOH											
			MeOH											
			MeOH			227 3.84								
			MeOH											
			MeOH											
			PET. ETHER											
			PET. ETHER									286 4.02		
67	PARATHION	56-38-2	EtOH									284 4.02		
68	PENTACHLORONITROBENZENE	82-68-8	CYCLOHEXANE								274 3.60			
69	PENTACHLOROPHENOL	87-86-5	ALCOHOL											302 2.81
			DIOXAN											300 3.40
			ETHER										296 3.35	
			H2O										293 3.30	303 3.50
			MeOH			224 3.91								301 3.33
			n.s.g.								273 3.02	280 2.96		
			n.s.g.		215 4.76									304 3.40
70	PHENACETIN	62-44-2	CHLOROFORM						250 3.87					305 3.58
			CHLOROFORM						250 4.10			287 2.22		
			MeOH					249 4.00						
71	PHENYLENEDIAMINES	-------												
71a	1,2-PHENYLENEDIAMINE	95-54-5	BENZENE										295 3.68	
			CCl4										294 3.79	
			CYCLOHEXANE				236 3.82					289 3.54		
			CYCLOHEXANE				235 3.80					285 3.40		
			CYCLOHEXANE				236 3.82					289 3.54		
			CYCLOHEXANE										293 3.86	
			DIOXAN										297 3.64	
			ETHER										296 3.61	
			EtOH	207 4.60			238 4.40					289 4.00		
			EtOH				238 3.86						294 3.48	
			EtOH				237 3.80						291 3.40	
			EtOH										295 3.50	
			H2O				231 3.73					288 3.44		
			H2O							266 2.30				
			MeOH				237 3.85						294 3.57	
			MeOH				236 3.81						294 3.52	
			MeOH				237 3.90						293 3.60	
71b	1,3-PHENYLENEDIAMINE	108-45-2	CYCLOHEXANE					240 3.85					293 3.42	
			CYCLOHEXANE					240 3.85					293 3.42	
			EtOH		212 4.60							287 3.50		
			EtOH		216 3.91								294 2.96	
			EtOH				235 3.80						293 3.30	
			EtOH				230 4.00						293 3.48	
			MeOH											303 3.47
71c	1,4-PHENYLENEDIAMINE	106-50-3	BENZENE											

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^{12} LogE12	^{13} LogE13	^{14} LogE14	^{15} LogE15	^{16} LogE16	^{17} LogE17	^{18} LogE18	^{19} LogE19	^{20} LogE20	^{21} LogE21	^{22} LogE22	^{23} LogE23	^{24} LogE24	^{25} LogE25	^{26} LogE26	(Source of Reference)
314 3.98															R7-4-65
311 4.04															R1-05981
315 4.05			345 3.72												R7-3-59
310 4.00															R7-4-65
313 3.92															R7-7-64
311 4.02															R7-10-46
312 4.03															R7-0-38
311 4.03															R7-17-29
310 4.00															R0-p681
															R7-2-55
															R7-2-55
															R7-1-340
															R7-17-25
															R0-p684
															R7-10-39
															R7-1-67
															R7-13-37
															R1-0279
															R7-16-27
															R7-12-32
															R7-1-341
															R7-1-341
															R1-0252
															R7-17-39
															R7-17-39
															R0-b492
															R7-4-82
															R7-4-82
															R7-17-39
															R7-17-39
															R7-17-39
															R7-16-39
															R7-2-68
															R7-1-99
															R7-1-99
															R7-4-82
															R7-3-72
															R7-5-68
															R7-1-99
															R7-6-80
															R0-b493
															R7-4-82
															R7-16-39
															R7-5-68
															R7-1-99
															R7-1-99
323 3.47															R7-3-72
															R7-17-40

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-3
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 Lo
			CYCLOHEXANE					246 3.93						
			CYCLOHEXANE					246 3.93						
			CYCLOHEXANE											
			DIOXAN											
			DIOXAN					242 4.00						306 3.
			ETHER											
			EtOH											
			EtOH					244 4.04						
			EtOH					243 3.86						
			EtOH					244 3.62						
			EtOH					242 4.00						306 3.
			EtOH				239 3.81						290 3.52	
			EtOH	198 4.50				244 3.86						
			HEXANE					246 4.00						304 3.
			HEXANE					246 4.15						
			H2O											
			NaOH							261 2.00				
72	N-PHENYLTHIOUREA	103-85-5	ALCOHOL					243 4.00						
			EtOH					245 4.00		266 4.19				
			EtOH					242 4.02			279 4.24			
			EtOH					245 4.00		266 4.19				
			EtOH							267 4.04				
			EtOH-HCl					245 3.97		267 4.14				
			H2O							265 4.12				
			H2O					240 4.20						
			H2O		210 4.08			240 4.10						
			NaOH					240 4.79						
73	PANOPHOS	52-85-7	(to be determined)							264 4.10				
74	PHTHALIC ACID ESTERS, N.O.S.	------												
74a	BUTYL BENZYL PHTHALATE	(see 017)												
74b	BIS(2-ETHYLHEXYL)PHTHALATE	(see 015)												
74c	PHTHALIC ACID DIBUTYL ESTER	(see 031)												
74d	PHTHALIC ACID DIETHYL ESTER	(see 037)												
74e	PHTHALIC ACID DIMETHYL ESTER	(see 046)												
74f	DI-n-OCTYL PHTHALATE	(see 052)												
75	PHTHALIC ANHYDRIDE	85-44-9	CCl4											
			CCl4									287 3.20	295 3.30	
			DIOXAN			221 3.94			251 3.66			287 3.20	295 3.30	
			DIOXAN						251 3.60			289 3.32	298 3.30	
			ETHER									288 3.30	297 3.20	
			EtOH					249 3.70			279 3.20	288 3.30	297 3.30	
			EtOH			225 3.90					274 3.10	281 3.00		
			EtOH		214 4.30							288 2.90		
			HEPTANE		211 4.58			246 3.55				286 3.22	295 3.15	
			NaCN					245 3.74				286 3.38	295 3.44	
			NaOH						254 3.60				291 3.30	
76	2-PICOLINE	109-06-8	ALCOHOL			224 3.94								
			CHLOROFORM						256 3.31	262 3.34	269 3.24			
										263 3.65				

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
^12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
315 3.30															RB-b494
315 3.30															R7-4-82
319 3.43															R7-17-40
															R7-12-46
	325 3.47														R7-17-40
	323 3.76														R7-17-40
															R7-6-80
311 3.19															R7-6-80
312 3.85															R7-5-48
															R7-1-99
															R7-1-99
310 3.17															R7-2-48
312 3.19															R7-2-48
															R7-16-39
316 3.42															R7-17-40
318 3.58															R7-17-40
															R7-3-72
															R7-16-39
															RB-p112
															R7-11-74
															R7-3-107
															R7-3-107
															R7-3-107
															R7-5-102
															R7-3-107
															R7-3-107
															R7-16-40
															R1-84592
															RB-p813
															R7-4-140
															R7-15-91
															R7-1-170
															R7-1-170
															R7-1-170
															R7-1-170
															R7-15-91
															R7-5-121
															R7-6-142
															R1-839
															RB-p2019
															R7-2-64

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA												
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm		
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE1		
			CYCLOHEXANE						259 3.40							
			CYCLOHEXANE						254 3.40	261 3.40	269 3.29					
			CYCLOHEXANE						256 3.40	261 3.39	268 3.27					
			CYCLOHEXANE	203 3.77						261 3.42						
			ETHER							267 3.40						
			EtOH						256 3.48	262 3.55	268 3.40					
			EtOH						256 3.40	262 3.50	269 3.30					
			EtOH	202 3.76						262 3.54						
			EtOH						256 3.31	262 3.34	269 3.24					
			EtOH						255 3.40	265 3.50	270 3.40					
			n-HEXANE							260 3.40						
			H2O							260 3.30						
			ISOOCTANE							260 3.40						
			ISOOCTANE						255 3.30	264 3.30	270 3.20					
			MeOH						256 3.39	262 3.38	268 3.26					
			MeOH					246 3.44	250 3.52	256 3.40						
			MeOH							262 3.35						
			MeOH							261 3.53	268 3.42					
77	6-PROPYL-2-THIOURACIL	51-52-5	EtOH							261 3.39						
			MeOH								276 4.24					
78	PYRIDINE	110-86-1	CHLOROFORM								276 4.20					
			CYCLOHEXANE					251 3.30	250 3.40	267 3.20						
			CYCLOHEXANE						253 3.30							
			CYCLOHEXANE						251 3.30							
			CYCLOHEXANE					251 3.10	256 3.10		279 2.00	284 1.00	298 1.40			
			CYCLOHEXANE						251 3.30							
			CYCLOHEXANE					241 3.12	251 3.30	262 3.15	279 2.29	283 2.00				
			CYCLOHEXANE						251 3.30		278 2.45					
			DIOXAN						252 3.40	258 3.40						
			EtOH						251 3.71							
			EtOH						253 3.56							
			EtOH						255 3.95							
			EtOH						255 3.47							
			EtOH					247 3.60	257 3.45	263 3.30						
			EtOH						257 3.30							
			EtOH					247 3.10	257 3.30	263 3.10						
			EtOH						257 3.43							
			EtOH					251 3.39	257 3.43	263 3.26						
			HEPTANE						255 2.50							
			n-HEPTANE	175 4.70					250 3.30							
			HEXANE						250 4.20							
			HEXANE						254 3.20			283 2.50				
			HEXANE					248 3.30			274 2.60	286 2.40	295 2.15			
			HEXANE	200 3.51					253 3.20							
			HEXANE						251 3.22							
			n-HEXANE						251 3.30							
			n-HEXANE						250 3.32	256 3.30						
			H2O						252 3.32			281 2.01				
									250 3.30							

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
															R7-11-44
															R7-1-94
															R7-1-94
															R7-13-48
															R7-1-94
															R7-1-94
															R7-1-94
															R7-13-48
															R7-3-48
															R7-2-44
															R7-2-44
															R7-2-44
															R7-2-44
															R7-2-44
															R7-1-94
															R7-10-55
															R7-11-44
															R7-11-44
															R1-89
															R7-10-63
															R7-4-131
															R7-1-44
															R7-1-44
															R7-1-44
															R6-p1939
															R7-11-20
															R7-4-32
															R7-4-32
															R7-3-31
															R7-10-26
															R7-2-28
															R7-2-28
															R7-3-31
															R7-3-31
															R7-4-31
															R7-1-43
															R7-1-43
															R7-5-30
															R7-7-37
															R7-1-44
															R7-2-28
															R7-5-30
															R7-1-44
															R7-6-39
															R7-10-26
															R7-7-37
															R7-2-28
															R7-2-28
															R7-6-39

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE11
			H2O						257 3.50					
			ISOOCTANE						252 3.20					
			ISOOCTANE						251 3.24	256 3.22				
			ISOOCTANE						250 3.30					
			MeOH							263 3.62				
			MeOH						253 3.62					
			MeOH					246 3.26	257 3.43	263 3.26				
			MeOH					246 3.26	257 3.43	263 3.20				
79	RESERPINE	50-55-5	CHLOROFORM							268 3.15			295 4.02	
			CHLOROFORM							268 3.15				
			EtOH		219 4.60					269 4.06				
			EtOH		216 4.79					267 4.23			295 4.07	
			EtCN			220 4.60							296 4.00	
			EtOH							262 4.20				
			EtCN							268 4.15		290 3.95		
			EtOH							268 4.15		288 3.95		
			MeOH		216 4.79					267 4.23			295 4.01	
			MeOH							267 4.00			294 4.00	
80	RESORCINOL	108-46-3	ALCOHOL			220 3.79					276 3.33			
			EtOH								275 3.52			
			EtOH								277 3.34			
			EtOH	207 4.00	219 3.85						276 3.38	283 3.32		
			EtOH			220 3.79					276 3.33			
			EtOH	207 4.00	219 3.85						276 3.38	283 3.32		
			50%EtOH								278 3.26			
			EtOH-MeOH				239 3.86					288 3.47		
			EtOH-MeOH				239 3.86					288 3.47		
			DIOXAN			221 3.83				269 3.22	277 3.36	283 3.30		
			DIOXAN			221 3.83				269 3.22	277 3.36	283 3.30		
			DIOXAN								277 3.32	283 3.28		
			MeOH								276 3.33	283 3.26		
			MeOH								276 3.33			
			MeOH	206 4.21							276 3.36	282 3.30		
			MeOH	207 4.10		222 3.80					278 3.33			
			MeOH								275 3.32			
81	SAFROLE	94-59-7	ALCOHOL				236 3.62					285 3.38		
			EtOH				236 3.62					285 3.38		
			9.5%EtOH									285 3.53		
			n-HEXANE	205 4.42			236 3.73					288 3.63		
			ISOOCTANE				236 3.66					285 3.57	289 3.59	
82	STRYCHNINE	57-24-9	ALCOHOL						225 4.10			290 3.63	299 3.53	
			EtOH						254 4.11		278 3.62	288 3.42		
			EtOH						255 4.06					
			EtOH						253 4.10			288 3.50	298 3.40	
			EtOH							260 4.20			299 3.50	
			EtOH						255 4.10			288 3.63	298 3.53	
			EtOH						254 4.11					
			EtOH						254 4.10		278 3.63	288 3.53		
			H2O						255 4.10					

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
															R7-1-43
															R7-1-44
															R7-1-44
															R7-2-28
															R7-4-31
															R7-11-20
															R7-2-28
															R7-10-26
															R8-r6
															R7-4-1088
															R7-6-1224
															R7-2-841
															R7-2-841
															R7-2-841
															R7-2-841
															R7-2-841
															R7-2-842
															R8-4574
															R7-19-25
															R7-1-90
															R7-14-35
															R7-3-66
															R7-15-43
															R7-3-66
															R7-14-35
															R7-15-43
															R7-14-36
															R7-15-43
															R7-10-53
															R7-1-90
															R7-4-74
															R7-9-42
															R7-15-43
															RI-89700
															R8-s7
															R7-3-243
															R7-1-322
															R7-2-214
															R7-3-243
															R8-s153
															R7-9-494
															R7-6-920
															R7-5-714
															R7-2-661
															R7-1-905
															R7-1-905
															R9-1145
															R7-2-661

(Continued)

TABLE 4. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-349nm
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE3	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE11
			n.s.g.											
			n.s.g.						257 4.00					
83	PHENACETAMIDE	62-55-5	ALCOHOL		210 3.66				257 4.20				290 3.53	
			ETHER			224 3.64				260 4.00				
			EtOH		210 3.63					266 4.10				
			EtOH		217 4.63					266 4.10				
			HEPTANE								271 4.66			
			H2O				231 3.77			267 4.14				
			H2O							260 4.00				
			H2O							261 4.00				309 1.00
			H2O							262 4.00				
			H2O		210 3.64					262 4.14				
			H2O	205 3.75						261 4.09				301 2.05
84	2,4,5-TRICHLOROPHENOL	95-95-4	H2O		210 3.66					261 4.07				
			CHLOROFORM							261 4.00				
			EtOH										291 3.43	
			0.10 N aOH										292 3.47	
85	2,4,6-TRICHLOROPHENOL	88-06-2	DIOXAN					244 3.95						
			ETHER									288 3.44		
			EtOH										290 3.50	297 3.50
			H2O										294 3.44	
			n.s.g.									286 3.23		
			n.s.g.										290 3.44	
86	2,4,5-TRICHLOROPHENOXY ACETIC ACID	93-76-5	HEXANE,acid										296 2.48	
			aOH	286 4.68								289 3.60	297 3.40	
87	2,4,5-TRICHLOROPHENOXYPROPIONIC ACID	93-72-1	aOH									288 3.40	296 3.37	
88	BYS-TRIBUTYROBENZENE	99-35-4	ALCOHOL			222 4.50						288 3.38		
			BENZENE											
			BENZENE											
			CCl4											303 3.60
			CCl4											303 3.60
			CYCLOHEXANE			221 4.40								
			EtOH			225 4.23		240 4.23						
			EtOH			222 4.45								
			EtOH			225 4.41								300 --
			EtOH			226 4.43								
			EtOH			223 4.47								
			EtOH			222 4.50								
			ISOOCTANE			227 4.10								
			HEPTANE			222 4.50								
			HEXANE			224 4.48						288 2.74		
			H2O				230 4.43							
			H2O			229 4.45								
			H2O				230 4.50							
			aOH			225 4.46								
			aOH			223 4.50								
89	TRYPAN BLUE	72-57-1	(to be determined)											
90	URACIL MUSTARD	66-75-1	EtOH-acid						257 3.76					

n.s.g. - no solvent given.

(Continued)

TABLE 4. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	440-449nm	>500nm	
*12 LogE12	*13 LogE13	*14 LogE14	*15 LogE15	*16 LogE16	*17 LogE17	*18 LogE18	*19 LogE19	*20 LogE20	*21 LogE21	*22 LogE22	*23 LogE23	*24 LogE24	*25 LogE25	*26 LogE26	(Source of Reference)
															R7-1-905
	327 1.71			358 1.44											R7-4-856
															R8-a593
					367 1.35										R7-17-2
															R7-4-5
															R7-4-5
															R7-6-5
															R7-6-5
															R7-6-5
															R7-3-4
310 1.90															R7-15-2
															R7-17-2
															R7-14-2
310 3.62															R9-09136
															R2-17-30510
															R2-17-3051a
															R8-a702
															R7-10-41
															R7-1-69
															R7-1-69
															R7-13-38
															R7-16-27
															R7-12-33
		330 2.50													R7-1-171
				355 2.40											R1-013140
															R1-810914.5
			345 2.30			370 2.20									R8-a981
				357 2.20											R7-4-52
															R7-2-45
															R7-2-45
			340 —												R7-2-45
															R7-8-33
															R7-2-45
															R7-10-41
		330 2.50													R7-1-69
															R7-5-45
				350 2.26											R7-4-51
															R7-4-51
															R7-4-51
															R7-1-69
	325 2.50														R7-5-45
															R7-5-45
															R7-4-51
															R7-4-51
															R7-16-28
															R1-01006
															R7-4-101

(Continued)

TABLE 5. SPECTRAL DATA OF UV ACTIVE NONPOLAR ORGANIC COMPOUNDS

				UV SPECTRAL DATA																			
				<200-209nm		210-219nm		220-229nm		230-239nm		240-249nm		250-255nm		255-259nm		260-269nm		270-279nm		280-289nm		290-299nm	300-309n
I.D.#	COMPOUND	CAS. No.	Solvent	^1	LogE1	^2	LogE2	^3	LogE3	^4	LogE4	^5	LogE5	^6	LogE6	^7	LogE7	^8	LogE8	^9	LogE9	^10	LogE10	^11	LogE11	^12	LogE
1	BENZ(c)ACRIDINE	225-51-4	MeOH					224	4.53											274	4.76	286	4.67				
			MeOH																			280	4.90				
			EtOH																	276	4.76	285	4.73				
			EtOH			214	4.39	224	4.58									267	4.68	274	4.82	285	4.75				
2	BENZ(a)ANTHRACENE	56-55-3	EtOH							230	4.60							260	4.50	270	4.60	280	4.90	295	5.10	300	4.10
			EtOH									245	4.30			255	4.50	268	4.70			280	4.80	290	4.90	300	3.90
			EtOH							228	4.64			250	4.20												
			EtOH					220	4.63	227	4.62					254	4.60	267	4.66								
			EtOH					224	4.40	227	4.40					255	4.50	266	4.70	277	4.70	288	4.90			300	4.00
			EtOH							230	4.40					255	4.60	270	4.70	275	4.80			290	4.90	300	3.90
			EtOH													254	4.56	267	4.60	277	4.85	287	4.95			300	3.99
			EtOH													260	4.60	265	4.70	275	5.00	280	5.00				
			EtOH					225	4.60	230	4.60					258	4.60	270	4.60			280	4.80	290	4.90	299	4.00
			EtOH																								
			EtOH					221	4.59	228	4.53					258	4.60	268	4.72	277	4.81	288	4.91			299	3.96
			EtOH													256	4.56	267	4.61	277	4.89	288	4.99			300	3.95
			EtOH													256	4.56	267	4.62	277	4.90	287	4.99			300	3.95
			Heptane													255	4.50	268	4.50	275	4.80	288	4.90				
			Heptane					220	4.56	228	4.51					256	4.52	268	4.60	278	4.88	288	4.98				
			Isooctane					221	4.56	228	4.54			251	4.53	256	4.53	267	4.58	277	4.86	287	4.96			298	4.91
			Isooctane																	280	4.90	285	4.98				
			MeOH																	277	4.84	288	4.95			300	3.93
3	BENZENE	71-43-2	Cyclohexane											254	2.33			268	1.13								
			EtOH	203	3.90											255	2.36										
			EtOH	207	3.76							243	2.15	249	2.34	255	2.35	260	2.28								
			EtOH	207	3.76							243	2.15	249	2.34	255	2.35	260	2.28								
			EtOH											249	2.29	255	2.37	261	2.20								
			MeOH	203	3.87																						
			MeOH	202	3.80											255	2.35										
			MeOH													254	2.43										
			Dioxan									243	2.15	249	2.33	255	2.36	261	2.27								
			Dioxan									243	2.15	249	2.33	255	2.36	261	2.27								
			Pentane									243	1.87	249	2.15	255	2.27	261	2.16	269	0.78						
			Hexane									243	1.95	249	2.21	255	2.32	261	2.16	269	0.94						
			Heptane									243	1.95	249	2.22	255	2.33	261	2.16	269	0.93						
4	BENZENE,DICHLOROMETHYL	98-87-3	Cyclohexane					220	3.88											270	2.47						
			Cyclohexane													260	2.40	265	2.50	272	2.30						
			Cyclohexane													260	2.40	265	2.50	272	2.30						
			Isooctane					220	3.89							261	2.49	266	2.53	272	2.42			292	1.31		
			Isooctane															265	2.65								
5	BENZO(b)FLUORANTHENE	205-99-2	Alcohol													256	4.54									301	4.54
			EtOH													256	4.85									300	3.90
6	BENZO(j)FLUORANTHENE	205-82-3	Alcohol									242	4.60														
			EtOH					223	4.69			240	4.65							279	4.12			291	4.28	307	4.45
			EtOH					226	4.58			242	4.60													300	4.38
			EtOH									245	4.64									283	4.26	295	4.37		
			Dioxan											250	4.44			268	3.76					294	4.19	309	4.46
7	BENZO(a)PYRENE	50-32-8	Alcohol					225	4.44									265	4.66	274	4.50	284	4.66	296	4.76		
			MeOH																					296	4.80		
			EtOH					220	4.40							255	4.60	268	4.70			285	4.70	297	4.80		
			EtOH					225	4.42							254	4.63	266	4.67	274	4.50	284	4.70	297	4.76		

(Continued)

TABLE 5. SPECTRAL DATA OF UV ACTIVE NONPOLAR ORGANIC COMPOUNDS

(Continued)

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	>440nm	
^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
					360 4.00									R1-19734
		336 3.77	346 3.88		363 4.00		383 4.03							R7-8-417
			347 3.80		363 3.91		382 3.91							R7-4-657
315 3.80		330 3.90		350 3.90	360 3.80		385 3.20							R7-4-657
		330 3.80	340 3.80		360 3.60	375 2.80	382 2.90							R7-5-576
312 4.08	329 4.22		344 4.14											R7-5-576
														R7-5-576
	325 3.70		340 3.70	358 3.60		372 2.70	384 2.80							R7-3-669
	325 3.80		340 3.80		360 3.60		385 2.80							R7-3-669
313 3.63	328 3.80		341 3.87	358 3.69	366 3.41	376 2.73	385 3.07							R7-3-670
														R7-6-754
312 3.70	325 3.80		342 3.90		360 3.70	375 2.70	380 2.90							R7-2-546
	327 3.82		341 3.89	358 3.71										R7-1-751
	325 3.80		341 3.84	359 3.66		373 2.70	385 2.86							R7-1-751
314 3.67	327 3.81		341 3.87	358 3.72	364 3.46	375 2.73	385 2.95							R7-1-751
314 3.67	326 3.81		341 3.87	358 3.72	363 3.46	376 2.73	384 2.95							R7-1-751
														R7-1-751
														R7-1-751
313 3.66	326 3.80		341 3.86	358 3.71		374 2.71	384 2.96							R7-3-669
							385 2.95							R7-4-703
			341 3.84											R7-6-754
														R1-81124
														R1-579
														R7-11-38
														R7-14-32
														R7-15-39
														R7-17-31
														R7-11-38
														R7-13-44
														R7-15-39
														R7-15-32
														R7-14-31
														R7-17-31
														R7-17-31
														R7-17-31
														R7-1-126
														R7-1-126
														R8-t437
														R7-1-126
		338 3.96			369 3.84									R1-2489
			346 3.46		363 3.70									R8-b1226
											420 3.92			R7-4-794
318 4.48		332 4.04					383 4.00							R8-b1227
318 4.50		332 4.11	347 3.62		365 3.91		384 4.10							R7-7-858
318 4.48		332 4.04	349 3.5b		365 3.82	376 3.73	383 4.00							R7-11-687
310 4.56		334 4.25	351 3.78		367 4.04	377 4.11	386 4.16			414 3.25		438 3.06		R7-18-652
318 4.47		333 4.08	349 3.60		365 3.91		384 4.06							R7-19-654
			347 4.10		364 4.36		384 4.44		403 3.60					R8-b2062
					364 4.40									R7-4-794
			345 4.10		365 4.30		380 4.40		405 3.60					R7-2-618
		330 3.73	347 4.12		364 4.33		385 4.46		403 3.60					R7-4-794

(Continued)

TABLE 5. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA										
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-255nm	255-259nm	260-269nm	270-279nm	280-289nm	290-299
				^1 LogE1	^2 LogE2	^3 LogE3	^4 LogE4	^5 LogE5	^6 LogE6	^7 LogE7	^8 LogE8	^9 LogE9	^10 LogE10	^11 Log
			EtOH			226 4.40				255 4.58	265 4.65	274 4.44	284 4.62	296 4.7
			Cyclohexane								266 4.73	273 4.53	285 4.70	297 4.8
8	BENZOTRICHLORIDE	98-07-7	Cyclohexane							262 2.60	267 2.70	274 2.60		
			Cyclohexane			225 4.00				260 2.80	265 2.80	275 2.80		
			Cyclohexane							262 2.60	267 2.70	274 2.60		
			Isooctane			224 3.86			253 2.53	262 2.62	268 2.70	274 2.60		
			MeOH			225 3.84				260 2.70	267 2.75	274 2.65		
9	BENZYL CHLORIDE	100-44-7	Alcohol		217 3.85									
			EtOH		217 3.85									
			EtOH		218 3.83				254 2.31	260 2.39	266 2.34			
			Cyclohexane						255 2.22	261 2.32	267 2.28	272 2.03		
			Cyclohexane			224 3.68				259 2.54				
			Cyclohexane			220 3.68				260 2.30				
			Cyclohexane					240 2.20		260 2.30	265 2.30			
			Isooctane					248 2.43		260 2.33	266 2.28	272 2.03	280 1.11	
			MeOH		216 3.84				253 2.28	259 2.36	265 2.32			
10	4-BROMOPHENYL PHENYL ETHER	101-55-3	Alcohol									272 3.18	279 3.18	
			Cyclohexane				235 4.22					278 3.29		
			EtOH				232 4.12					270 3.20	278 3.20	287 2.9
			EtOH									272 3.18	279 3.18	
11	CHLORINATED BENZENES, N.O.S.													
11-1	CHLOROBENZENE	108-90-7	Alcohol					245 1.95	251 2.34	258 2.13	264 2.45	272 2.32		
11-2	1,2-DICHLOROBENZENE	95-50-1	a			224 3.96			250 1.95	255 2.12	262 2.34	271 2.46	277 2.45	
11-3	1,3-DICHLOROBENZENE	541-73-1	a		217 3.93	221 3.90	225 3.65		250 1.88	256 2.16	263 2.40	270 2.55	278 2.47	
11-4	1,4-DICHLOROBENZENE	106-46-7	a				225 4.12		253 2.11	258 2.28	266 2.50	273 2.64	281 2.57	
11-5	1,2,3-TRICHLOROBENZENE	87-61-6	Alcohol								265 2.10	273 2.20	280 2.10	
			EtOH								265 2.10	273 2.20	280 2.10	
			MeOH			224 3.91					264 2.16	271 2.25	279 2.14	
11-6	1,2,4-TRICHLOROBENZENE	120-82-1	Alcohol									270 2.54	278 2.75	287 2.7
			EtOH									270 2.54	278 2.75	287 2.7
			MeOH		219 3.97	226 3.96								
11-7	1,3,5-TRICHLOROBENZENE	108-70-3	Alcohol								269 2.51	277 2.68	284 2.64	
			EtOH								266 2.26	273 2.37	281 2.23	
			EtOH							256 1.80		273 2.20	283 2.10	
11-8	1,2,3,4-TETRACHLOROBENZENE	634-66-2	Alcohol								266 2.26	273 2.37	281 2.23	
			Cyclohexane									274 2.42	290 2.52	291 2.4
			EtOH										281 2.47	
			Hexane									274 2.42	280 2.52	291 2.4
11-9	1,2,3,5-TETRACHLOROBENZENE	634-90-2	Alcohol									274 2.39	283 2.54	292 2.4
			EtOH									274 2.32	281 2.50	291 2.4
			Hexane									274 2.32	281 2.50	291 2.4
11-10	1,2,4,5-TETRACHLOROBENZENE	95-94-3	Alcohol									274 2.35	284 2.62	293 2.7
			Cyclohexane				231 4.07					276 2.81	285 3.02	294 3.0
			EtOH											294 3.1
			Hexane									276 2.81	285 3.02	294 3.0
11-11	PENTACHLOROBENZENE	608-93-5	Alcohol								270 2.48	278 2.79	287 3.06	296 3.0
			EtOH										280 2.56	298 2.5
			EtOH										286 2.61	298 2.6
			Hexane										280 2.56	298 2.5
			n.s.p.		219 4.33					261 2.49	274 2.39	278 2.40	289 2.49	298 2.5
11-12	HEXACHLOROBENZENE	118-74-1	EtOH										289 2.57	298 2.5
														291 2.3

(Continued)

TABLE 5. Continued

300-309nm	310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	>440nm	
^12 LogE12	^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference)
			331 3.65	347 4.04		364 4.30		384 4.37		404 3.50					R7-4-794
			331 3.78	347 4.17		364 4.43		385 4.50		404 3.64					R7-4-794
															R8-t598
															R7-5-83
															R7-1-121
															R7-1-121
															R1-380
															R8-t391
															R7-2-96
															R7-1-136
															R7-19-39
															R7-9-65
															R7-1-136
															R7-1-136
															R7-1-136
															R1-85
															R8-e511
															R1-2269
															R7-2-290
															R7-4-374
															R8-e407
															R7-1-71,4-53,5-48;R8-e535
															R7-1-71,4-53,5-48;R8-e536
															R7-1-71,2-47,4-53,5-48;R8-e183
															R8-e952
															R7-4-51
															R1-1673
															R8-e953
															R7-4-51
															R1-1277
															R8-e954
															R7-1-69
															R7-4-51
															R8-e931
															R1-5935
															R7-4-49
															R7-4-50
															R8-e932
															R7-4-49
															R7-4-50
															R8-e933
															R1-2976
															R7-4-49
															R7-4-50
															R8-e919
															R7-9-30
															R7-5-44
															R7-5-44
															R7-5-44
341 2.32															R7-5-44

(Continued)

TABLE 5. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA											
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-255nm	255-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
				^1 LogE1	^2 LogE2	^3 LogE3	^4 LogE4	^5 LogE5	^6 LogE6	^7 LogE7	^8 LogE8	^9 LogE9	^10 LogE10	^11 LogE11	^12 LogE1
			Isooctane											291 2.32	301 2.25
			Isooctane											291 2.32	301 2.25
			Hexane										280 2.35	291 2.41	299 2.36
			n.s.g.			222 4.42	232 4.28							291 2.40	298 2.36
12	2-CHLORONAPHTHALENE	91-58-7	EtOH			227 4.00					267 2.60				
			EtOH								263 3.76	270 3.73	276 3.80		
			MeOH			226 4.91						270 3.67		288 3.47	
			MeOH			226 4.91					267 3.60	270 3.67		288 3.47	307 2.53
			Cyclohexane			227 4.97					267 3.77		275 3.75	289 3.54	308 2.65
13	CHRYSENE	218-01-9	Alcohol			222 4.55				258 4.96	268 5.20			295 4.08	
			EtOH							258 4.96	267 5.20		282 4.09	293 4.09	305 4.13
			Heptane	194 4.26											
14	DDD	72-54-8	Alcohol				233 4.30								
			EtOH	205 4.46		220 4.19	235 4.26					277 2.65			
			EtOH				233 4.30								
			MeOH				231 4.29				268 2.81				
15	DDE	72-55-9	EtOH					245 4.24							
			EtOH					247 4.30							
			DOIEtOH					245 4.30				270 4.20			
16	DDT	50-29-3	Alcohol					240 4.30				270 2.80			
			95%ALCOHOL				236 ----								
			EtOH	205 4.51		220 4.21		240 4.29			267 2.82				
			Hexane					240 3.93				270 2.93			
			n.s.g.									270 2.80	280 2.70		
17	DIBENZ(a,h)ACRIDINE	226-36-8	EtOH								260 2.80				
			Dioxan						250 4.29						
18	DIBENZ(a,j)ACRIDINE	224-42-0	EtOH								262 4.28	270 4.41	289 4.93	297 4.99	
			95%EtOH								260 4.40			290 4.80	
19	DIBENZO(a,h)ANTHRACENE	53-70-3	EtOH								260 4.40			290 4.81	
			EtOH				230 4.50					273 4.70	285 4.90	295 5.20	306 4.40
			MeOH									277 4.72			
			Isooctane			225 4.61									300 5.10
			Benzene							258 4.56			285 4.86	296 5.10	
			Benzene											290 4.93	300 5.10
20	7H-DIBENZO(c,g)CARBAZOLE	194-59-2	EtOH				230 4.50							290 5.00	300 5.10
			EtOH					240 4.50			266 4.42		280 4.69	288 4.73	300 4.32
			EtOH					240 4.50	252 4.28				280 4.50		300 4.30
			Dioxan					240 4.48				279 4.52			301 4.35
			Dioxan			220 4.58						277 4.57			300 4.37
21	DIBENZO(a,e)PYRENE	192-65-4	Benzene									277 4.56			300 4.38
			Benzene											294 4.72	306 4.83
			Benzene											294 4.76	306 4.88
			n.s.g.											294 4.70	306 4.80
22	DIBENZO(a,h)PYRENE	189-64-0	EtOH					242 4.60		256 4.80				299 4.70	308 4.90
			Benzene								264 4.70			290 4.40	301 4.90
			Alcohol,Benzene					242 4.60		256 4.70	264 4.70			290 4.54	301 4.90
23	DIBENZO(a,i)PYRENE	189-55-9	EtOH			222 4.60		242 5.00							
			Benzene									272 4.70	285 4.70	297 4.80	
			Alcohol,Benzene			223 4.70		242 5.00				273 4.65	285 4.70	297 4.85	
24	1,2-DICHLOROBENZENE	95-50-1	Alcohol						250 1.96	256 2.13	263 2.36	270 2.44	277 2.37		
			EtOH						250 1.98	256 2.13	263 2.36	270 2.44	277 2.37		

(Continued)

TABLE 5. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	≥440nm	
^{13} LogE13	^{14} LogE14	^{15} LogE15	^{16} LogE16	^{17} LogE17	^{18} LogE18	^{19} LogE19	^{20} LogE20	^{21} LogE21	^{22} LogE22	^{23} LogE23	^{24} LogE24	^{25} LogE25	^{26} LogE26	(Source of Reference)
														88-e787
														87-1-67
														87-5-44
														87-5-44
310 1.60	323 1.60													87-7-253
														87-5-201
	322 2.25													88-e110
	322 2.25													87-4-254
	323 2.45													87-4-254
	320 4.12		344 2.81	353 2.57	361 2.80									88-c313
319 4.13			343 2.81	351 2.51	360 2.81									87-2-546
														87-2-546
														88-e182
														87-17-345
														87-1-551
														81-18450
														87-14-375
														87-1-544
														87-1-544
														88-e183
														89-2023
														87-17-341
														87-11-376
														87-14-378
312 4.08		333 3.95		351 3.63		370 3.91		393 4.05						87-1-888
318 4.16		333 4.06	346 3.76	354 3.76		370 4.10	383 3.63	395 4.29						87-11-733
	325 3.90	338 3.86		358 3.80		375 4.06		397 4.20						87-1-888,889
	325 3.90	335 3.90		358 3.80		375 4.00		397 4.30						86-549-51
	320 4.30	332 4.25	349 4.20		364 2.70	373 3.60	384 2.60	394 3.10						87-14-795
														87-5-739
				351 4.20										87-4-862
	321 4.23													87-15-685
	322 4.32	337 4.21		351 4.24		373 3.10	385 2.70	395 3.16						87-5-739
	322 4.20	335 4.10		350 4.10		375 3.10				410 3.10				87-4-862
	320 4.00	336 3.92	340 4.03	351 4.17										87-16-681
		332 3.90	348 4.20		366 4.40									87-2-620
		334 3.88	349 4.25		366 4.43									87-1-841
		332 3.91	347 4.30		365 4.48									87-14-703
		332 3.92	347 4.30		365 4.48									87-19-456
			343 4.06		360 4.24	378 4.30		396 3.24						86-e133
		330 3.82	344 4.10		360 4.32		380 4.34	399 3.22						87-7-1045
			343 4.00		360 4.20	378 4.20		396 3.20		416 2.80				87-1-975
	329 3.86				364 4.29		381 4.20	396 3.20						87-3-930
														87-1-975
313 5.20						379 3.60			401 4.10		424 4.40		451 4.60	87-1-975
313 5.20						379 3.60			401 4.00		424 4.40		451 4.50	83-5958C;Rb-9573
														87-1-975
317 4.40		332 4.30		356 4.30		375 4.00		397 4.90	408 3.80	419 3.10		433 3.10		87-1-975
317 4.45				357 4.35		? 375 4.75		397 4.95	408 3.80	419 3.10		436 3.10		83-5948C;Rb-9572
														88-e535
														87-4-53

(Continued)

TABLE 5. Continued

	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA											
				<200-209nm	210-219nm	220-229nm	230-239nm	240-249nm	250-255nm	255-259nm	260-269nm	270-279nm	280-289nm	290-299nm	300-309nm
				*1 LogE1	*2 LogE2	*3 LogE3	*4 LogE4	*5 LogE5	*6 LogE6	*7 LogE7	*8 LogE8	*9 LogE9	*10 LogE10	*11 LogE11	*12 LogE12
			Cyclohexane		216 3.93	219 3.90	224 3.74		249 1.88	255 2.10	261 2.40	270 2.54	277 2.51		
			Isooctane		219 3.96						269 2.51				
			Isooctane				224 4.13		253 2.11		260 2.32	272 2.42	277 2.55	282 2.67	
	1,3-DICHLOROBENZENE	541-73-1	Alcohol						250 1.90	256 2.15	263 2.40	270 2.52	278 2.43		
			EtOH						250 1.90	256 2.15	263 2.40	270 2.52	278 2.43		
			Cyclohexane		217 3.93	221 3.90	225 3.63		250 1.85	256 2.10	263 2.40	270 2.37	277 2.50		
			Isooctane		217 3.93	221 3.89	225 3.67		250 1.87	256 2.16	263 2.41	271 2.59	278 2.53		
	1,4-DICHLOROBENZENE	106-46-7	Alcohol							250 2.24	266 2.46	273 2.60	280 2.51		
			EtOH			225 4.11					265 2.48	272 2.39	280 2.52		
			EtOH							250 2.24	266 2.46	273 2.60	281 2.51		
			Cyclohexane			225 4.13			253 2.11	260 2.35	265 2.54	273 2.70	281 2.65		
			Isooctane			225 4.13			253 2.11	258 2.31	266 2.56	274 2.73	282 2.67		
			MeOH			224 4.11					264 2.46	271 2.58	280 2.48		
	DICHLOROBENZENE, N.O.S.	25321-22-6	(see 024,25,26)												
	7,12-DIMETHYLBENZ(a)ANTHRACENE	57-97-6	Alcohol											296 4.90	
			EtOH		210 4.40	225 4.40					265 4.50	275 4.60	285 4.80	298 4.80	
			Cyclohexane												
			MeOH				234 4.58				263 4.57	275 4.61	285 4.89	295 4.95	
	FLUORANTHENE	206-44-0	EtOH				236 4.66		252 4.17		261 4.16	276 4.40	287 4.66		309 3.56
			EtOH				235 4.60				260 4.10	275 4.46	287 4.50		308 3.60
			EtOH									277 4.51	283 4.39		310 3.64
			EtOH				236 4.66		253 4.17		262 4.16	276 4.40	287 4.66		309 3.56
			EtOH				236 4.74				261 4.25	277 4.43	287 4.69		310 3.57
			EtOH				235 4.60					278 4.36	287 4.50		310 3.90
			EtOH									276 4.37	287 4.62		
			Chloroform								259 4.30		291 4.60		
			Chloroform									277 4.51	289 4.68		310 3.64
			Cyclohexane				237 4.75		254 4.22		259 4.12	277 4.41	288 4.73		
			Cyclohexane				237 4.75		254 4.22		263 4.18	277 4.41	288 4.73		
			Hexane				236 4.70						287 4.60		
			Butan									278 4.20	285 4.40		
			Butan				236 4.66				262 4.12	277 4.36	287 4.61		309 3.57
			Isooctane			229 4.63	236 4.77				261 4.24	276 4.46	287 4.76		308 3.60
							236 4.78								309 3.96
10	HEPTACHLOR	76-44-8	Alcohol												
11	HEXACHLOROBUTADIENE	87-68-3	EtOH			225 4.20			252 3.60						
			Isopropanol			222 4.58									
			MeCN						249 3.55						
			MeOH			220 4.26		249 3.64							
			Heptane						253 3.70						
			Heptane						253 3.70						
			Hexane			222 4.27		247 3.80							
12	HEXACHLOROCYCLOPENTADIENE	77-47-4	EtOH												
			EtOH												
			EtOH												
			Isopropanol												
			n-Heptane												
			Heptane												
			Isooctane												
			MeOH												
			n.s.g.												
13	HEXACHLOROPHENE	70-30-4	MeOH	208 4.63											299 3.7

Continued

TABLE 5. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	>440nm	
^13 LogE13	^14 LogE14	^15 LogE15	^16 LogE16	^17 LogE17	^18 LogE18	^19 LogE19	^20 LogE20	^21 LogE21	^22 LogE22	^23 LogE23	^24 LogE24	^25 LogE25	^26 LogE26	(Source of Reference
														87-5-48
														81-1063
														87-1-71
														88-6534
														87-4-53
														87-5-48
														87-1-71
														88-6537
														87-2-47
														87-4-53
														87-5-48
														87-1-71
														81-55
			345 3.83		364 3.54		384 3.83							88-6183
					367 3.90									87-1-848
			345 3.50		360 3.80		380 3.50							87-6-864
			346 3.84											81-9279
	323 3.76		342 3.98	358 3.95										87-17-452
	322 3.80		340 3.98	358 3.90										87-3-356
	326 3.88		344 3.98		362 3.99									87-7-635
	323 3.76		342 3.90	359 3.95										87-7-635
	324 3.76		343 3.91	359 3.95										87-1-646
			340 4.00		360 4.00									87-1-646
	323 3.81		342 3.92	358 3.94										87-1-646
	325 3.80													87-5-687,688
	326 3.88		344 3.98		362 3.99									87-1-646
														87-4-394
														88-644
				356 3.90										87-1-646
					360 3.90									87-1-646
	320 3.76		340 3.86											87-1-646
	322 3.81		342 3.92	359 3.94										87-1-646
	323 3.78		341 3.91	359 3.97										88-6165
	320 3.88													87-2-11
														87-9-8
														87-6-13
														81-3229
														88-6453
														87-4-11
														87-7-13
														87-2-23
	322 3.26													87-2-23
	323 3.17													87-2-23
	323 3.17													87-7-29
	323 3.18													81-3-25
	323 3.20													88-c866
	323 3.20													87-13-20
	324 3.22													81-1397
	321 3.17													87-4-25
	323 3.17													81-01576

Continued

TABLE 5. Continued

I.D.#	COMPOUND	CAS. No.	Solvent	UV SPECTRAL DATA																			
				<200-209nm		210-219nm		220-229nm		230-239nm		240-249nm		250-255nm		255-259nm		260-269nm		270-279nm		280-289nm		290-299nm		300
				*1	LogE1	*2	LogE2	*3	LogE3	*4	LogE4	*5	LogE5	*6	LogE6	*7	LogE7	*8	LogE8	*9	LogE9	*10	LogE10	*11	LogE11	*12
			50%EtOH(PH3.4)																							
			50%EtOH(PH12.9)																					290	3.80	298
34	INDENO-(1,2,3-cd)PYRENE	193-39-5	EtOH																					292	4.65	303
			Cyclohexane																	270	4.34	276	4.39	292	4.63	304
			MeOH			210	4.70					249	4.92							275	4.49			292	4.52	302
35	METHOXYCHLOR	72-43-5	EtOH	205	4.67					230	4.35	245	4.22							273	3.62					
			EtOH	205	4.67					230	4.35	245	4.22							273	3.62					
			Benzene							230	4.36	238	4.20							270	3.90	275	3.80			
			Cyclohexane							230	4.36	246	4.20							270	3.90	275	3.80			
			MeOH					238	4.21			244	4.12							272	3.49	282	3.32			
			n.s.g.							230	4.36	247	4.20									280	3.56			
36	3-METHYLCHOLANTHRENE	56-49-5	Alcohol																							
			EtOH															262	4.56	274	4.60	284	4.00	297	4.90	
			EtOH																							
			Heptane	188	4.60																					
37	NAPHTHALENE	91-20-3	Alcohol					221	5.04											276	3.76	286	3.59			
			EtOH					225	4.00											270	3.90			290	3.90	
			EtOH					221	4.90													286	3.62			
			EtOH																	275	3.72					
			EtOH					221	5.05									263	3.80							
			EtOH,Heptane					221	5.60																	
			MeOH					220	5.10											275	3.80					
			Dichloromethane																	277	3.75					
			Cyclohexane																	275	3.75					
			Cyclohexane																							
			Cyclohexane					222	5.09													287	3.62			
			Hexane					220	5.18									268	3.90			284	3.35	299	2.30	306
			Isooctane							231	4.99									271	3.67					
38	POLYCHLORINATED BIPHENYLS, N.O.S.	1336-36-3	(to be determined)																							
39	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	Chloroform																							304
			Chloroform									248	3.07													314

n.s.g. - no solvent given.
*see #24, 25, 26.

Continued

TABLE 5. Continued

310-319nm	320-329nm	330-339nm	340-349nm	350-359nm	360-369nm	370-379nm	380-389nm	390-399nm	400-409nm	410-419nm	420-429nm	430-439nm	3440nm	
/ ^{13} LogE13	^{14} LogE14	^{15} LogE15	^{16} LogE16	^{17} LogE17	^{18} LogE18	^{19} LogE19	^{20} LogE20	^{21} LogE21	^{22} LogE22	^{23} LogE23	^{24} LogE24	^{25} LogE25	^{26} LogE26	(Source of Reference)
	321 4.10					378 4.19	386 4.06		408 3.79		434 3.65	454 3.25	462 3.14	87-16-304
316 4.21														87-16[1]304
314 4.26					361 4.21									87-3-852
														87-3-852
														81-11202
														87-14-518
														87-17-480
														80-e185
														87-2-491
	327 3.63		343 3.79	350 3.80										81-17345
														87-14-518
	327 3.63		343 3.79	350 3.80										80-c278
														87-1-892
311 2.38														87-1-892
														87-2-653
312 3.40														80-a14
														87-5-203
311 2.43														87-7-256
														87-14-169
312 2.40														87-17-149
311 2.35														87-6-262
312 2.40														87-13-187
														87-15-191
311 2.46										412 4.25				87-14-169
311 2.40														87-10-189
312 2.40	325 2.50													87-6-262
														87-6-262
														87-6-262
														87-16-249
														87-14-267

(Continued

O,O-diethylphosphoric acid O-p-nitrophenyl ester, 1,2-diphenylhydrazine, 4,4'-methylenebis(2-chloroaniline), methyl parathion, parathion, pentachloronitrobenzene, 2,4,5-trichlorophenoxypropionic acid and uracil mustard.

No spectral information was available for the following ten compounds: 5-(aminomethyl)-3-isoxazolal, butylbenzylphthalate, DNBP, coal tars, creosote, 2-cyclohexyl-4,6-dinitrophenol, Daunomycin, Diallate, and phosphorothioic acid O,O-dimethyl O-(p-(dimethylaminosulfonyl)-phenyl)ester, and trypan blue.

For the 39 nonpolar parameters listed in Method 8610, at least two different literature sources of the spectral data for each compound were entered on the data base, with the exception of polychlorinated biphenyls, N.O.S. For polychlorinated biphenyls the literature search was directed only towards the thirteen common commercial formulations (aroclors), and no spectral data was found for these.

Development of a Representative Subset of U.S. EPA Method 8610 Parameters

The ninety polar UV absorbing compounds from Method 8610 are shown separated into the various compound classes in Table 6. Representative compounds which were used in the subset for the evaluation of Methods 3560 and 8610 are marked with an asterisk (*) in the table. These compounds include 2,4-dimethylphenol, 2,4-dinitrophenol, 2,4,6-trichlorophenol, 2,4-D, butylbenzylphthalate, methylparathion, acetophenone, 1,4-naphthoquinone, 2,6-dinitrotoluene, aniline, 3,3'-dichlorobenzidine, pyridine, strychnine, thioacetamide, and 1,2-diphenylhydrazine.

The thirty nine nonpolar UV absorbing compounds from Method 8610 are shown separated into the various compound classes in Table 7. The compounds chosen for evaluation of Methods 3560 and 8610 are marked with an asterisk and include benzene, fluoranthene, benzotrichloride, m-dichlorobenzene, heptachlor, and methoxychlor.

Verification of Spectral Data of Subset Compounds and Acquisition of Spectral Data on Compounds for Which no Spectral Data was Obtained

A comparison of the literature spectral data on representative compounds listed in Method 8610 with experimentally determined data acquired in

TABLE 6. CLASSIFICATION OF POLAR COMPOUNDS FOR U.S. EPA METHODS 3560 AND 8610 EVALUATIONS

Compound Classification	U.S. EPA Method 8610 Parameters(a)	Availability of Reference Compounds in Battelle Repository
Phenols		
phenols, diols and thiophenols	Benzenethiol	NA(b)
	Diethylstilbesterol	NA
	*2,4-Dimethylphenol	A(c)
	Resorcinol	A
chlorinated phenols	p-Chloro-m-cresol	A
	2-Chlorophenol	A
	2,4-Dichlorophenol	A
	2,6-Dichlorophenol	A
	Pentachlorophenol	A
	2,4,5-Trichlorophenol	A
	*2,4,6-Trichlorophenol	A
nitrophenols	2-sec-Butyl-2,4-dinitro-phenol (DNBP)	NA
	2-Cyclohexyl-4,-dinitro-phenol	NA
	4,6-Dinitro-o-cresol	A
	*2,4-Dinitrophenol	A
	4-Nitrophenol	A
phenol mixtures	Creosote	NA
	Cresols	A
Acids	Chlorambucil	NA
	*2,4-Dichlorophenoxy-acetic acid (2,4-D)	A
	2,4,5-Trichlorophenoxy-acetic acid (2,4,5-T)	A
	2,4,5-Trichlorophenoxy-propionic acid (2,4,5-TP)	NA
Esters		
carboxylic acid esters	bis(2-Ethylhexyl) phthalate	NA
	*Butyl benzyl phthalate	A
	Chlorobenzilate	A
	Di-n-butyl phthalate	A

(Continued)

TABLE 6. (Continued)

Compound Classification	U.S. EPA Method 8610 Parameters(a)	Availability of Reference Compounds in Battelle Repository
	Diethyl phthalate	A
	Dimethyl phthalate	A
	Di-n-octyl phthalate	A
	Phthalic acid ester, N.O.S.	NA
	Phthalic anhydride	A
	Reserpine	NA
sulfur and/or phosphorus containing acid esters	Aramite	NA
	Diallate	OR
	O,O-Diethylphosphoric acid, O-p-nitrophenyl ester	NA
	*Methyl parathion	A
	Parathion	A
	Phosphorothioic acid, O,O-dimethyl O-(p(dimethylamino)-sulfonyl) phenyl)ester	OR(d)
Acetals	Dihydrosafrole	NA
	Isosafrole	NA
	Safrole	NA
Ketones	*Acetophenone	A
	3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin	A
Quinones	Mitomycin C	NA
	p-Benzoquinone	NA
	Daunomycin	NA
	*1,4-Naphthoquinone	A
Nitro Compounds	Dinitrobenzene, N.O.S.	OR
	2,4-Dinitrotoluene	A
	*2,6-Dinitrotoluene	A
	Nitrobenzine	A
	Pentachloronitrobenzene (PCNB)	A
	sym-Trinitrobenzene	A

(Continued)

TABLE 6. (Continued)

Compound Classification	U.S. EPA Method 8610 Parameters(a)	Availability of Reference Compounds in Battelle Repository
Amines		
amines	4-Aminobiphenyl	A
	*Aniline	A
	Auramine	NA
	Benzidine	A
	3,3'-Dimethylbenzidine	NA
	alpha,alpha-Dimethyl-phenethylamine	NA
	Diphenylamine	A
	1-Naphthylamine	A
	2-Naphthylamine	NA
	Phenylenediamine	OR
chlorinated amines and alcohol amines	N,N-Bis(2-chloroethyl)-2-napthylamine	NA
	p-Chloroaniline	A
	*3,3'-Dichlorobenzidine	A
	3,4-Dihydroxy-alpha-(methylamino)methylbenzyl alcohol	NA
	3,3'-Dimethoxybenzidine	A
	4,4'-Methylenebis-(2-chloroaniline)	NA
nitro amines	p-Nitroaniline	A
N-containing heterocyclic compounds	5-(Aminomethyl)-3-isoxazolol	OR
	Amitrole	OR
	Brucine	NA
	Methapyrilene	NA
	Nicotine	OR
	2-Picoline	A
	Propylthiouracil	A
	*Pyridine	A
	*Strychnine	A
	Uracil mustard	NA

(continued)

TABLE 6. (Continued)

Compound Classification	U.S. EPA Method 8610 Parameters(a)	Availability of Reference Compounds in Battelle Repository
Amides and thioamides	2-Acetylaminoflourene	NA
	Phenacetin	OR
	N-Phenylthiourea	NA
	*Thioacetamide	A
Hydrazines, hydrozide and azo compounds	Citrus red No. 2	NA
	p-Dimethylaminoazobenzene	OR
	*1,2-Diphenylhydrazine	A
	Maleic hydrazide	A
	Trypan blue	NA
Miscellaneous	Coal tars	NA

(a) Compounds marked with asterisk (*) were included in the subset used for method evaluations.
(b) NA = Not available in Battelle Repository.
(c) A = Available in Battelle Repository.
(d) OR = Compound was ordered but not received in time to be included in the evaluations or verifications.

TABLE 7. CLASSIFICATION OF NONPOLAR COMPOUNDS FOR U.S. EPA METHODS 3560 AND 8610 EVALUATIONS

Compound Classification	U.S. EPA Method 8610 Parameters(a)	Availability of Reference Compounds in Battelle Repository
Polycyclic aromatic hydrocarbons	Benzo[a]anthracene	A
	*Benzene	A
	Benzo[b]fluoranthene	A
	Benzo[j]fluoranthene	NA
	Benzo[a]pyrene	A
	Chrysene	A
	Dibenzo[ah]anthracene	A
	Dibenzo[ae]pyrene	NA
	Dibenzo[ah]pyrene	NA
	Dibenzo[ai]pyrene	NA
	7,12-Dimethylbenzo anthracene	NA
	*Fluoranthene	A
	Ideno 1,2,3-cd pyrene	A
	3-Methylcholanthrene	NA
	Naphthalene	A
Nitrogen containing polycyclic aromatic hydrocarbons	Benzo[c]acridine	NA
	Dibenzo[ah]acridine	NA
	Dibenzo[aj]acridine	A
	7H-Dibenzo[cg]carbazole	NA
Chlorinated hydrocarbons	Benzene, dichloromethyl	A
	*Benzotrichloride	A
	Benzyl chloride	A
	Chlorinated benzenes, N.O.S.	NA
	2-Chloronaphthalene	A
	DDD	A
	DDE	A
	DDT	A

(continued)

TABLE 7. (Continued)

Compound Classification	U.S. EPA Method 8610 Parameters(a)	Availability of Reference Compounds in Battelle Repository
	o-Dichlorobenzene	A
	*m-Dichlorobenzene	A
	p-Dichlorobenzene	A
	Dichlorobenzene, N.O.S.	-
	*Heptachlor	A
	Hexachlorobutadiene	A
	Hexachlorocyclopentadiene	A
	Polychlorinated biphenyls, N.O.S.	A
Halogenated aromatic ether and phenols	4-Bromophenyl phenyl ether	A
	Hexachlorophene	NA
	*Methoxychlor	A
	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	A

(a) Compounds marked with asterisk(*) were included in the subset used for method evaluations.
(b) NA = Not available in Battelle Repository.
(c) A = Available in Battelle Repository.

methanol is presented in Table 8. The literature data and the experimental data agree reasonably well. For Method 8610 analytes for which no literature data was obtained, the spectral data were determined experimentally except for 5-(aminomethyl)-3-isoxazolol, 2,4-dinitro-6-cyclohexyl phenol and trypan blue. These three compounds were ordered but were not received in time for UV determination. For polychlorinated biphenyls, the spectral data was determined for Aroclor 1242 and Aroclor 1260 since these mixtures are considered to be among the most common commercial PCB formulations.

The experimentally determined spectral data for Method 8610 analytes is presented in Table 9. All spectra were acquired in methanol solution on a Cary 14 recording spectrophotometer, and the concentrations were generally adjusted so that the spectral features were evident in the range of 0.1 to 1.0 absorbance units. The UV spectra of the nine compounds are presented in Figures 1 through 9 in the range of from 200 to 400 nm. The visible spectra of 2-sec-butyl-4,6-dinitrophenol and Daunomycin·HCL in the range of from 400 to 650 nm are presented in Figures 10 and 11.

Evaluation of Detection Limit

The UV spectra of benzene standards in methanol obtained on the Cary 14 with a reagent methanol reference are presented in Figure 12 for benzene concentrations ranging from 5 to 50 ppm. As shown, a concentration of 5 ppm does not show any significant absorbance using the Cary 14. At 25 ppm, some fine structure begins to appear near 250 nm, and at 50 ppm, the spectra of benzene is readily discernable. These data suggest that an absorbance reading of 0.05 to 0.1 absorbance units is necessary when using an older instrument such as the Cary 14 in order to distinguish a positive response from the normal background noise level of this instrument, which is estimated to be about 0.01 absorbance units. The use of an absorbance reading of 0.05 as a decision level for a positive response is higher by one order of magnitude than the proposed Method 8610 decision limit of 0.005 absorbance units.

The UV spectra of benzene standards in methanol obtained on the Cary 17 with a reagent methanol reference are presented in Figure 13 for benzene

TABLE 8. COMPARISON OF LITERATURE SPECTRAL DATA WITH EXPERIMENTAL DATA ON REPRESENTATIVE COMPOUNDS LISTED IN U.S. EPA METHOD 8610

Compound	Literature Data[a]			Experimental Data[b]	
	λ max	Log ε	Reference	λmax	Log ε
Nonpolar Aromatic Compounds					
Benzene	255	2.35	7	254	2.32
Benzotrichloride	224	3.86	7	227	4.09
1,3-Dichlorobenzene	270(alcohol)	2.55	7	270	2.63
Fluoranthene	287(ethanol)	4.66	7	287	4.58
Methoxychlor	245(ethanol)	4.22	7	228	4.31
				244	4.19
Polar Aromatic Compounds					
Acetophenone	242	4.07	5	240	4.14
Aniline	230	3.93	7	234	3.95
3,3'-Dichlorobenzidine	284	4.76	1	284	4.44,
2,4-Dichlorophenoxyacetic acid	230	3.98	1	230	4.04
	285	3.35	1	284	3.44
2,4-Dimethylphenol	281	3.33	7	280	3.40
2,4-Dinitrophenol	257	4.06,	1	350	4.06
	340	3.51	1		
2,6-Dinitrotoluene	332	3.99	1	232	4.09
1,2-Diphenylhydrazine	245	4.3,	8	245	4.3
	290	3.6,	8	290	3.6
	340(alcohol)	2.8	8	340	2.6
Methylparathion	272	3.90	1	271	4.04
1,4-Naphtoquinone	250	4.60	7	245	4.40
Pyridine	253	3.62	7	256	3.47
Strychnine	254(ethanol)	4.11	7	254	4.31

(continued)

TABLE 8. (Continued)

Compound	Literature Data[a]			Experimental Data[b]	
	λ max	Log ε	Reference	λ max	Log ε
Thioacetamide	266(ethanol)	4.10	7	266	4.02
2,4,6-Trichlorophenol	292(ethanol)	3.47	7	287	3.50

(a) Spectral data acquired in methanol unless otherwise noted.
(b) All experimental data acquired in methanol.

TABLE 9. EXPERIMENTALLY DETERMINED SPECTRAL DATA FOR COMPOUNDS FOR WHICH NO LITERATURE DATA WAS AVAILABLE

Compound	Concentration,(a) mg/L	Spectral Data λmax(nm)	Log ε
2-sec-Butyl-4,6-dinitrophenol	9.40	262	3.95
		370	4.05
Butyl benzyl phthalate	4.54	275	4.07
Coal Tar	6.76	244	2.93
		250	3.01
		271	2.71
		285	2.60
Creosote	22.2	275	2.21
Daunomycin·HCl	12.9	232	4.54
		251	4.38
		285	3.92
		475	4.03
		498	4.03
		530	3.74
Diallate	24.8	225	3.78
Aroclor 1242	12.1	244	2.56
Aroclor 1260	13.2	225	2.99
		275	1.75
Phosphorothioic acid; o,o-dimethyl-o-(p dimethylamino-sulfonyl) phenyl ester	11.1	230	4.13

(a) All spectral data acquired in methanol.

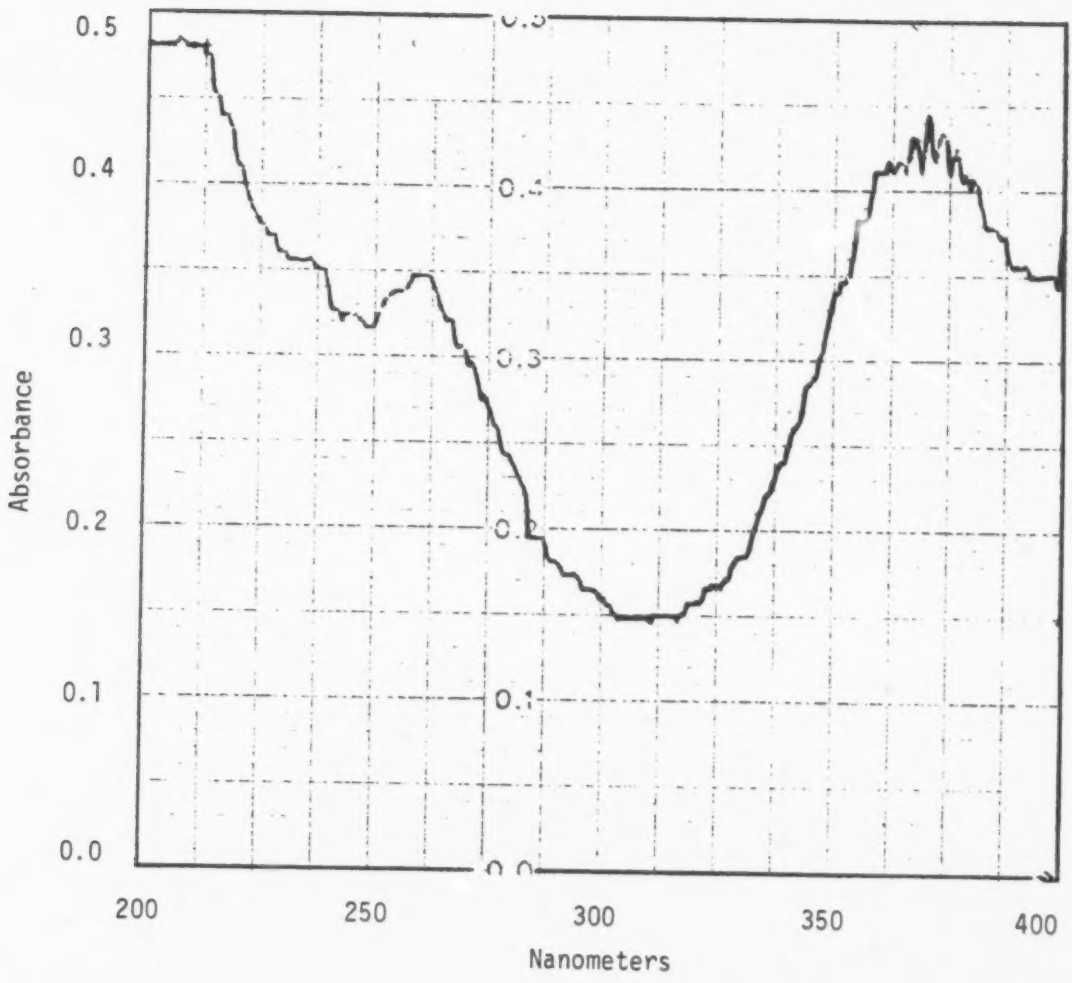

Figure 1. UV spectrum of 2-sec-butyl-4,6-dinitrophenol at a concentration of 9.4 ppm in methanol.

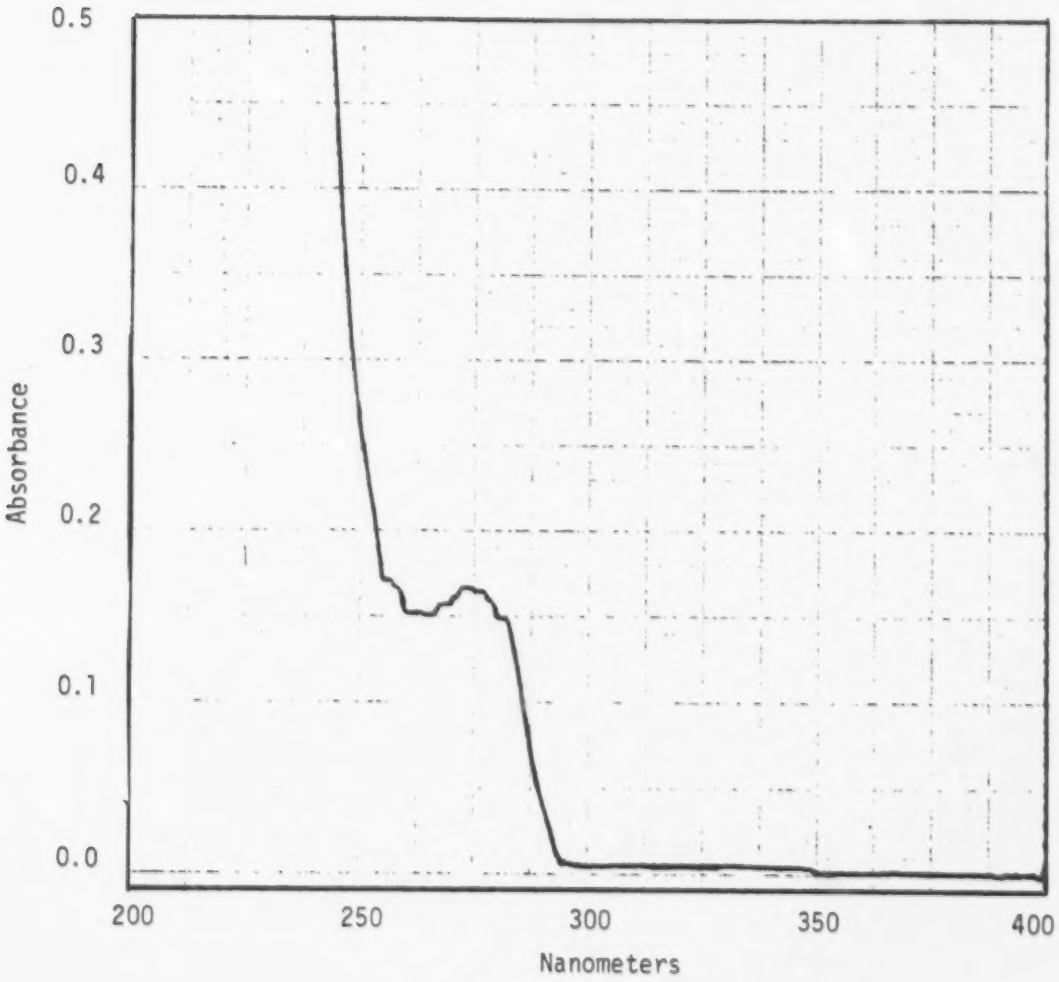

Figure 2. UV spectrum of butylbenzylphthalate at a concentration of 1.9 ppm in methanol.

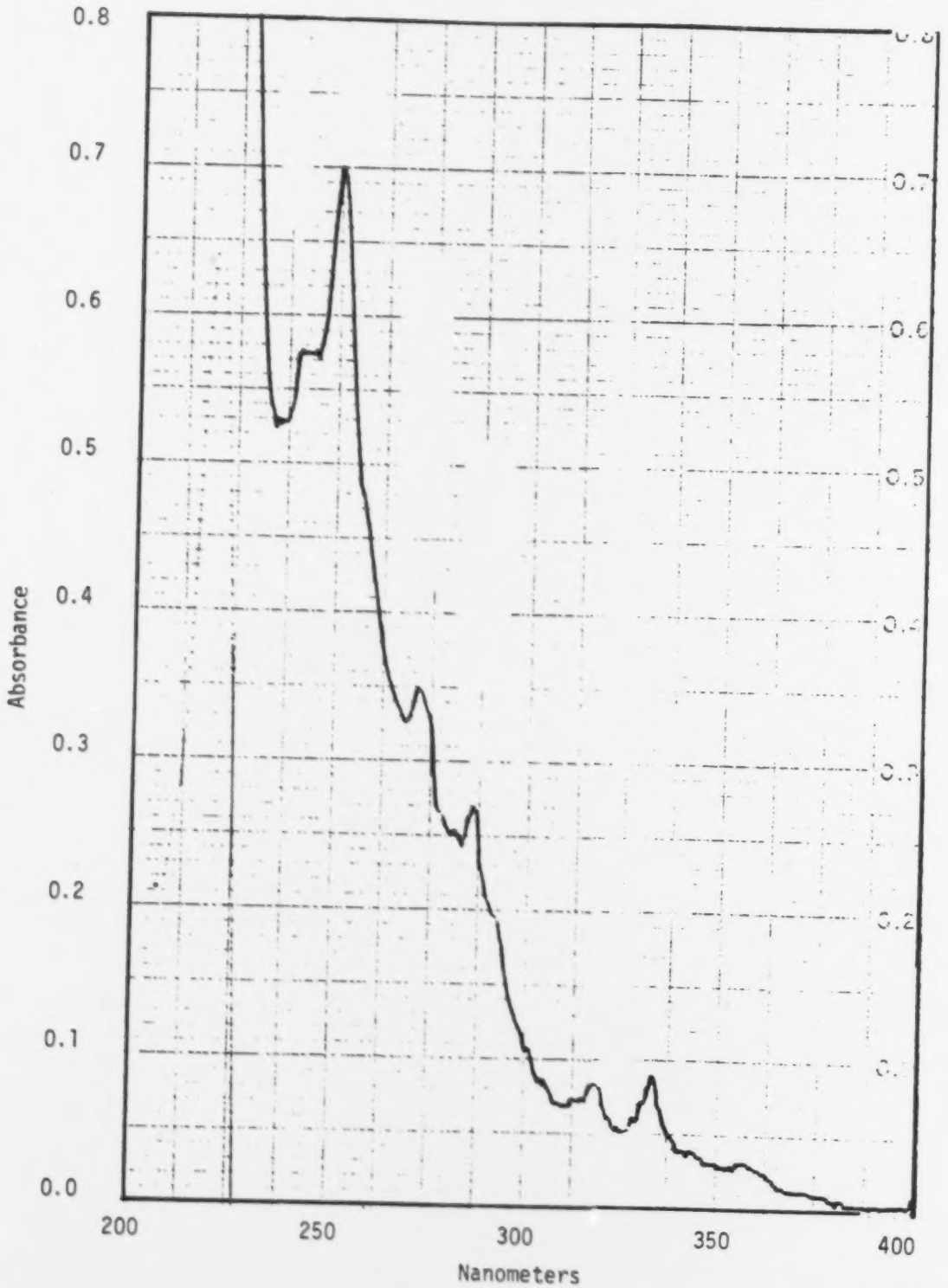

Figure 3. UV spectrum of coal tar at a concentration of 6.8 ppm in methanol.

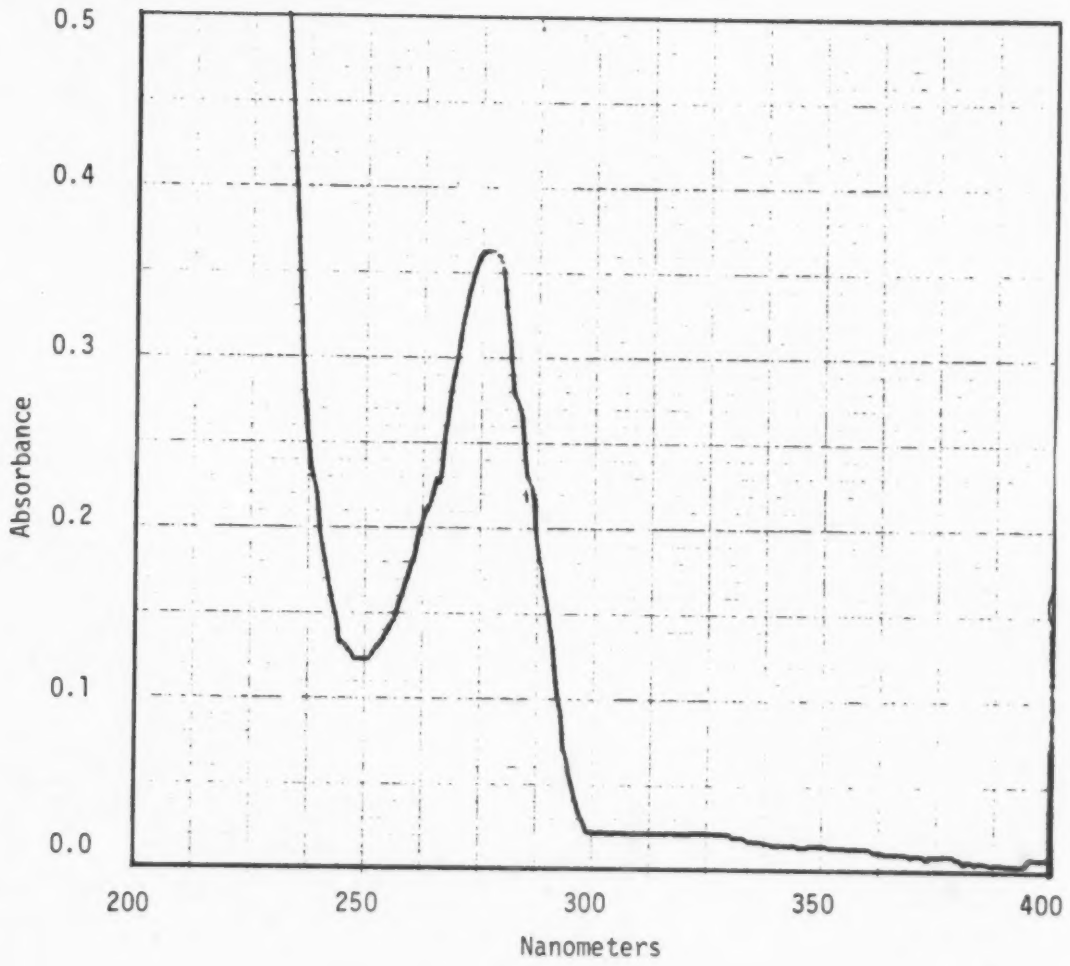

Figure 4. UV spectrum of creosote at a concentration of 22.2 ppm in methanol.

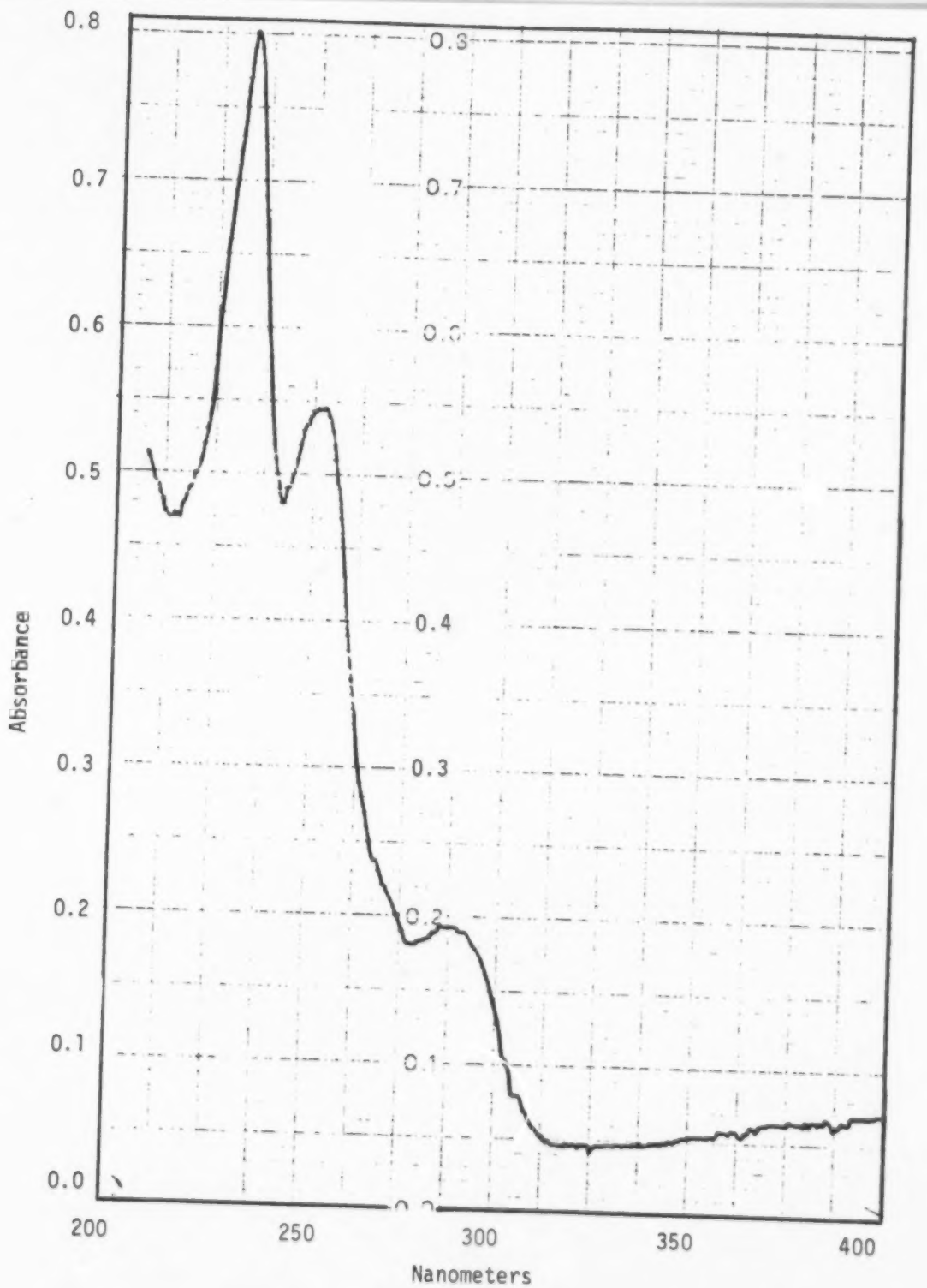

Figure 5. UV spectrum of daunomycin·HCL at a concentration of 12.9 ppm in methanol.

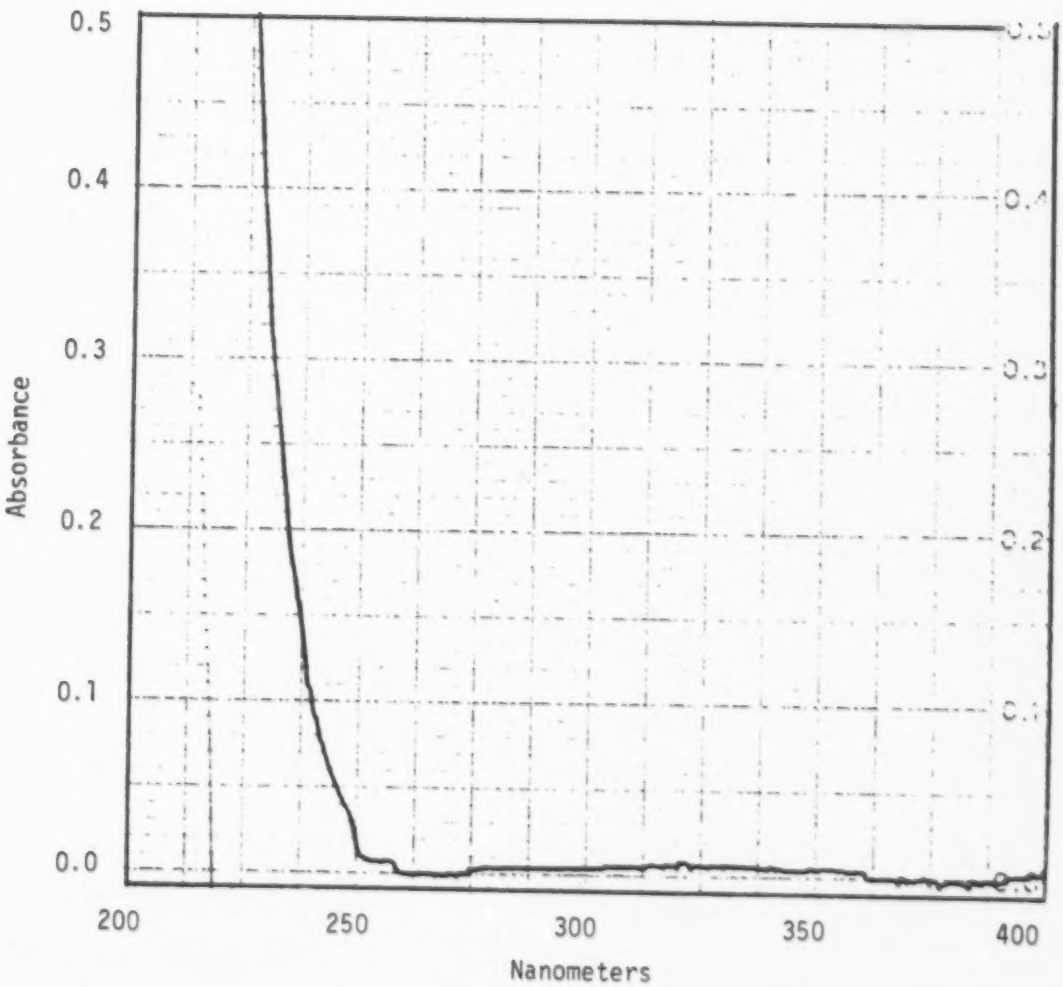

Figure 6. UV spectrum of diallate at a concentration of 248 ppm in methanol.

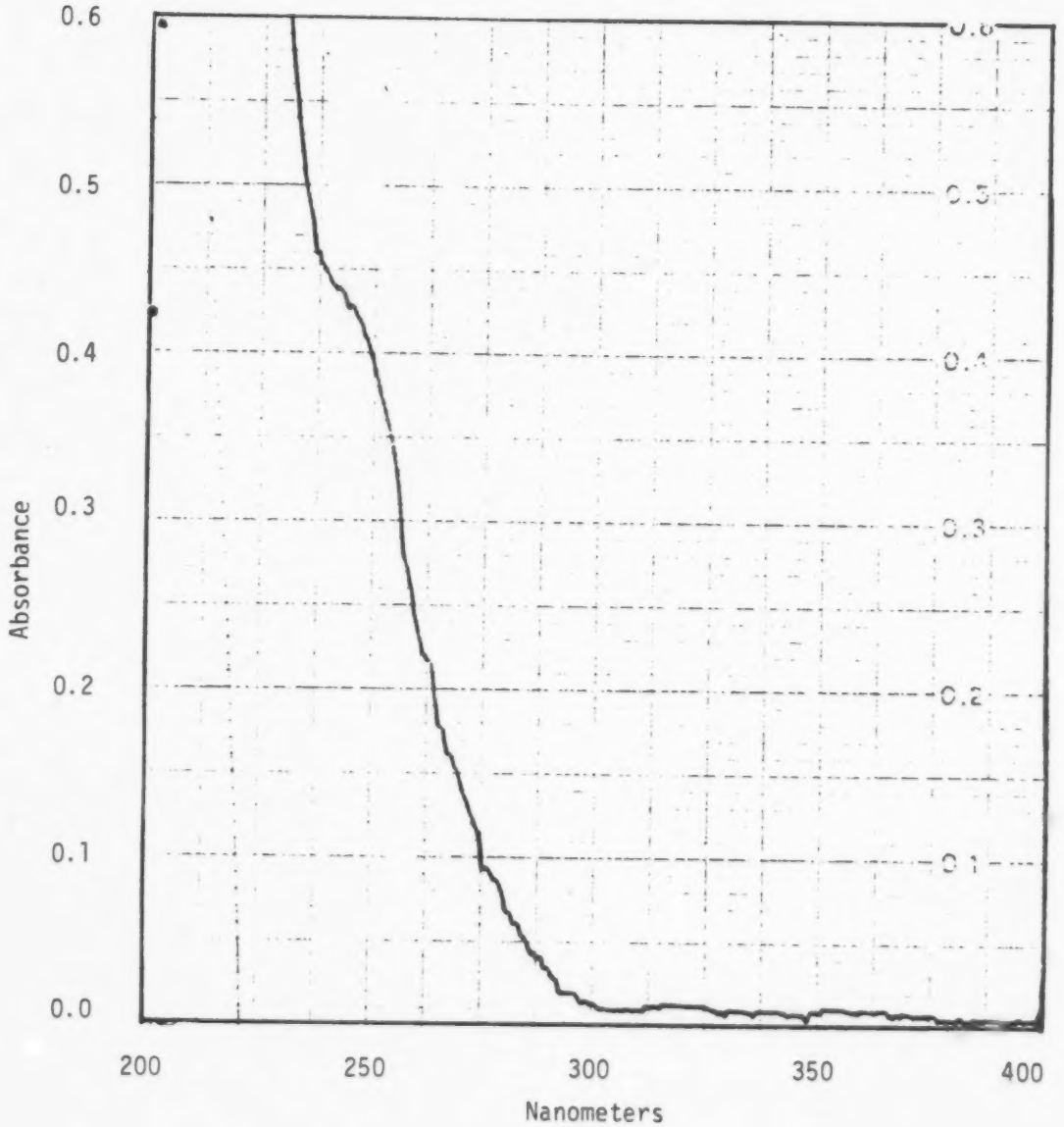

Figure 7. UV spectrum of aroclor 1242 at a concentration of 248 ppm in methanol.

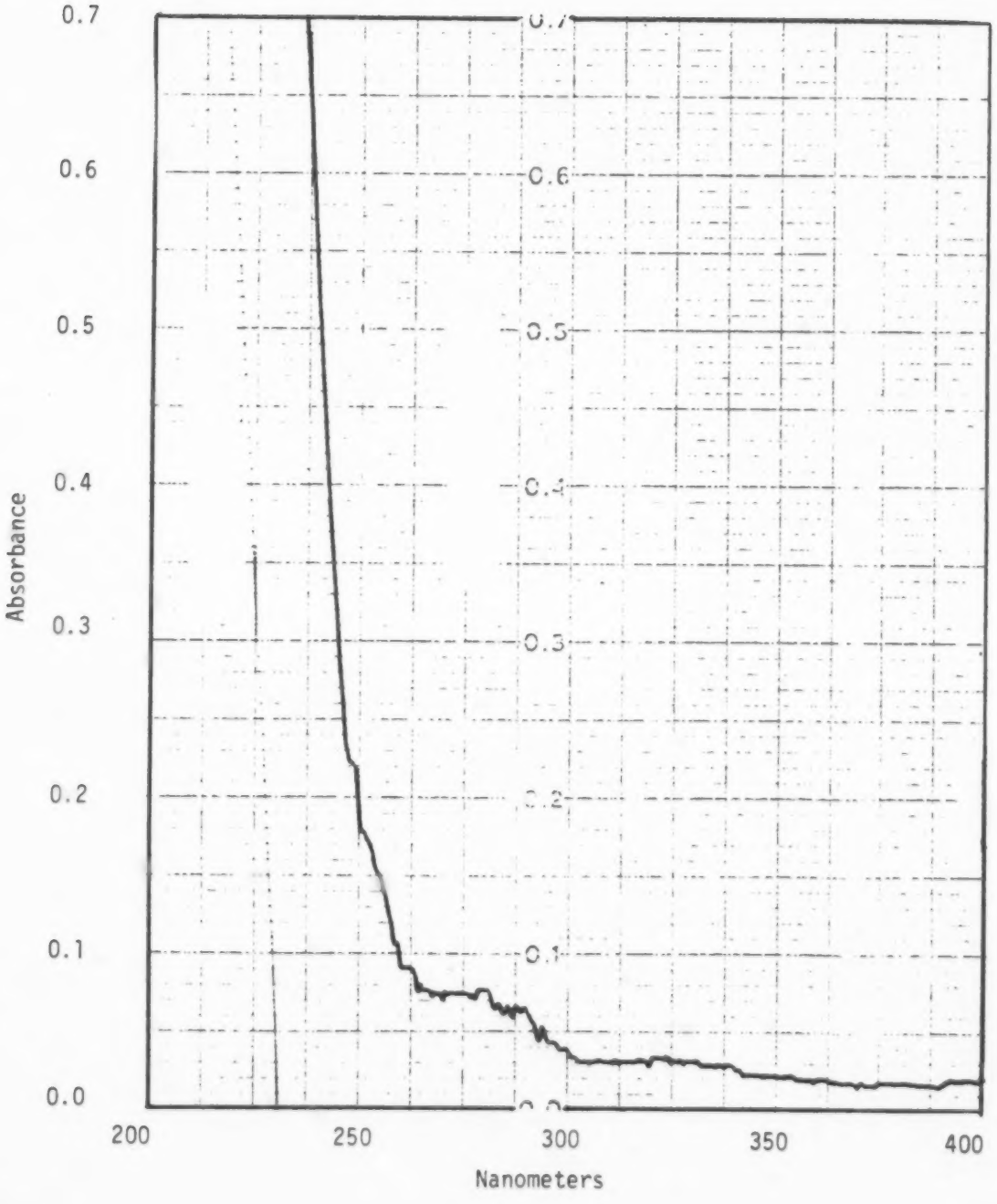

Figure 8. UV spectrum of aroclor 1260 at a concentration of 13.2 ppm in methanol.

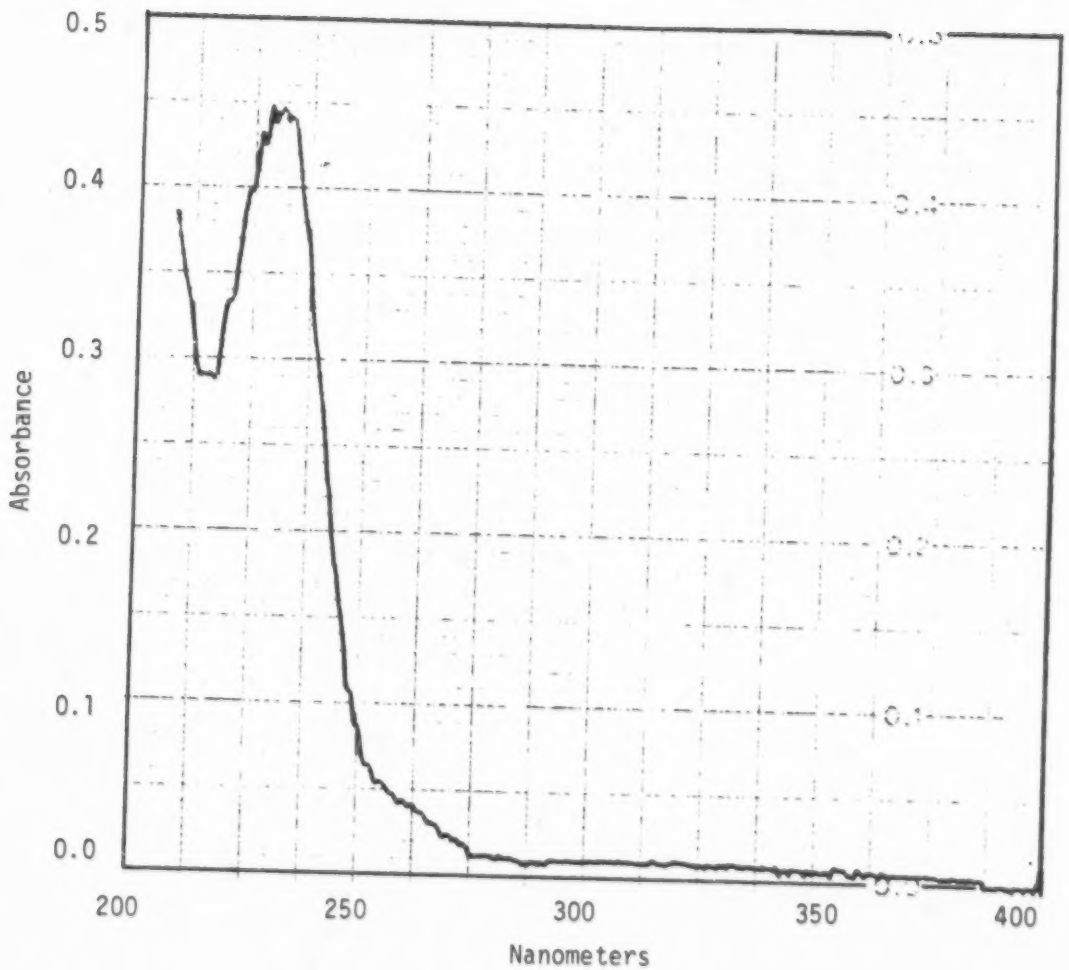

Figure 9. UV spectrum of phosphorothioic acid, o,o-dimethyl-o-(p [(dimethyl amino)-sulfonyl]-phenyl)ester at a concentration of 11.1 ppm in methanol.

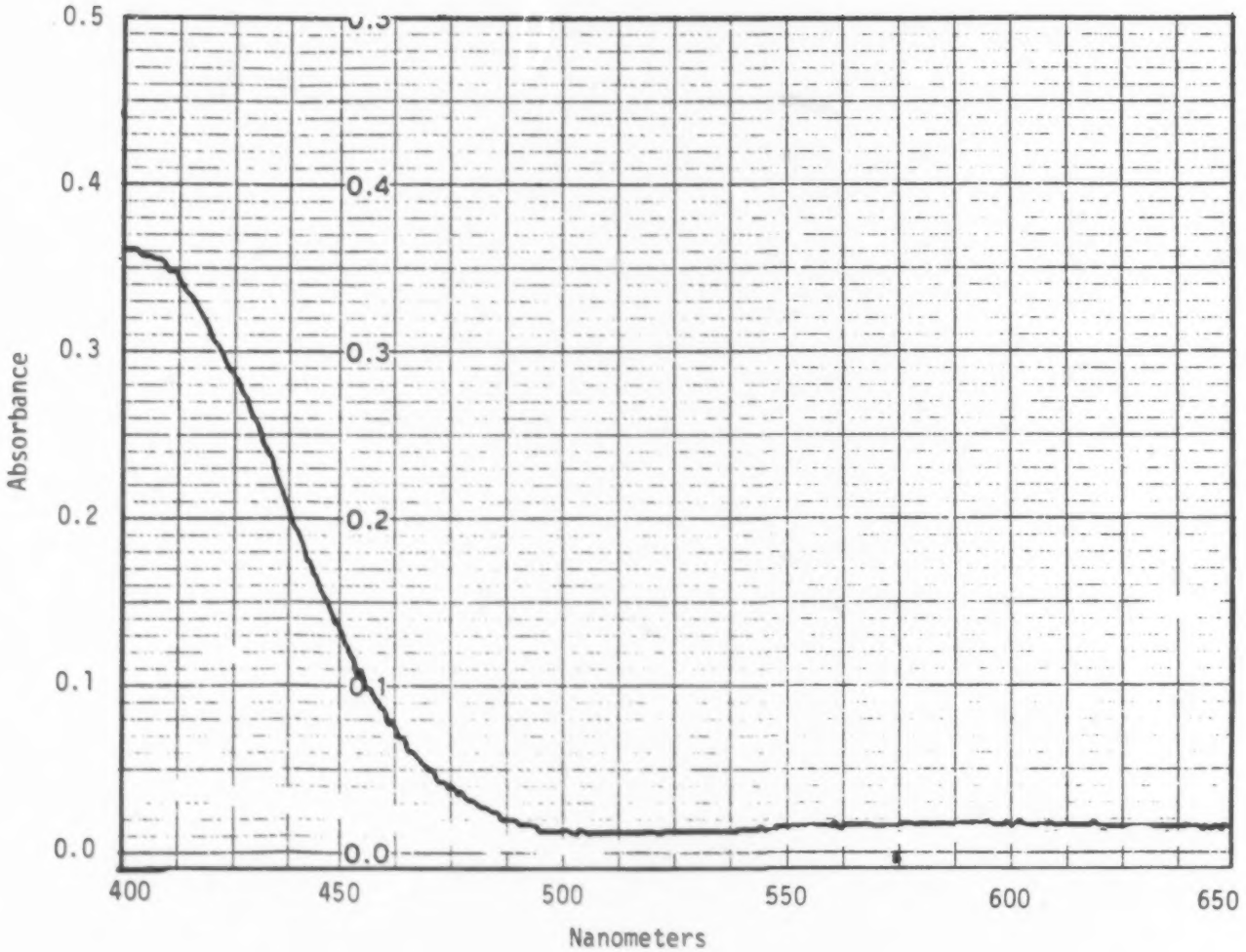

Figure 10. Visible spectrum of 2-sec-butyl-4,6-dinitrophenol at a concentration of 9.4 ppm in methanol.

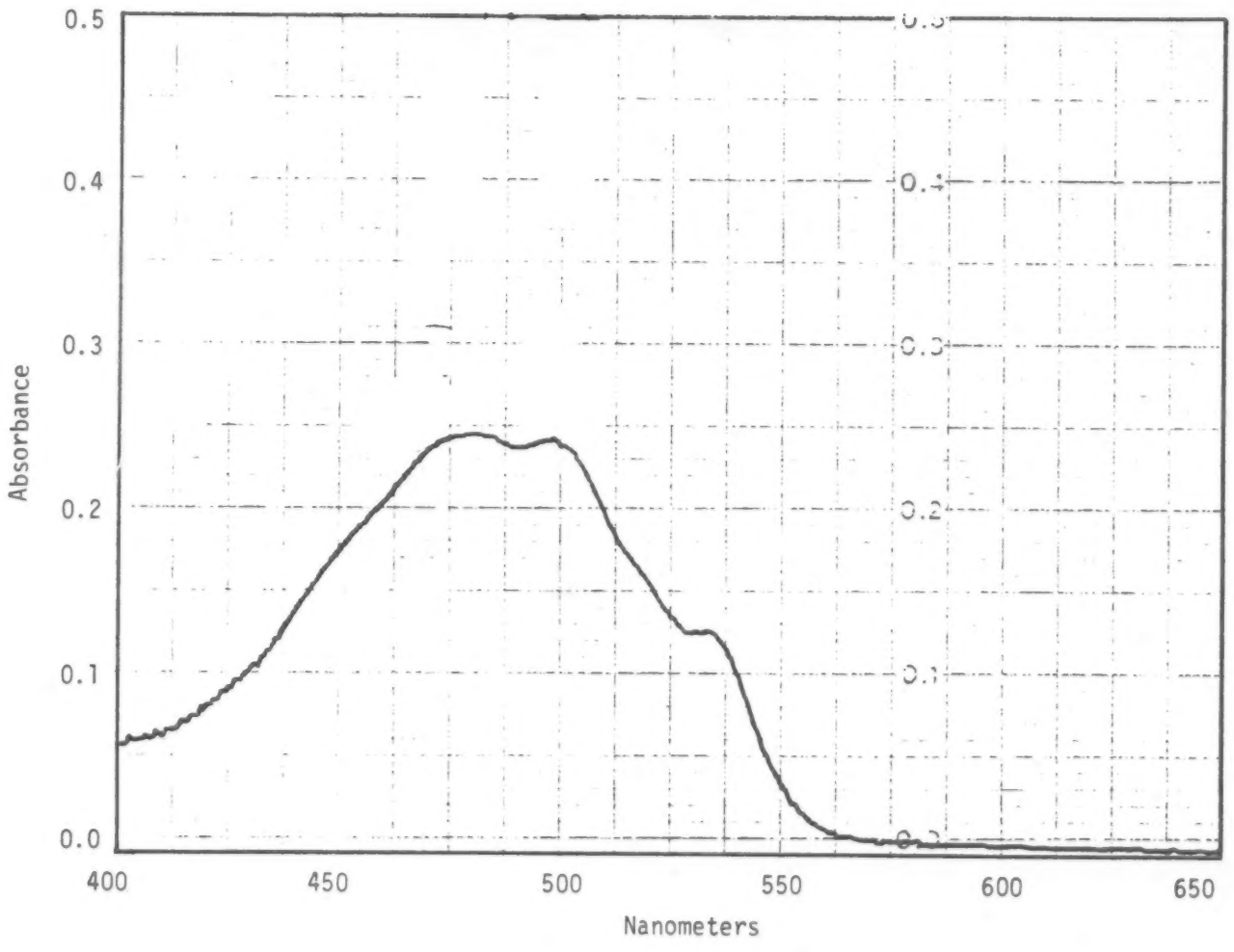

Figure 11. Visible spectrum of daunomycin at a concentration of 12.9 ppm in methanol.

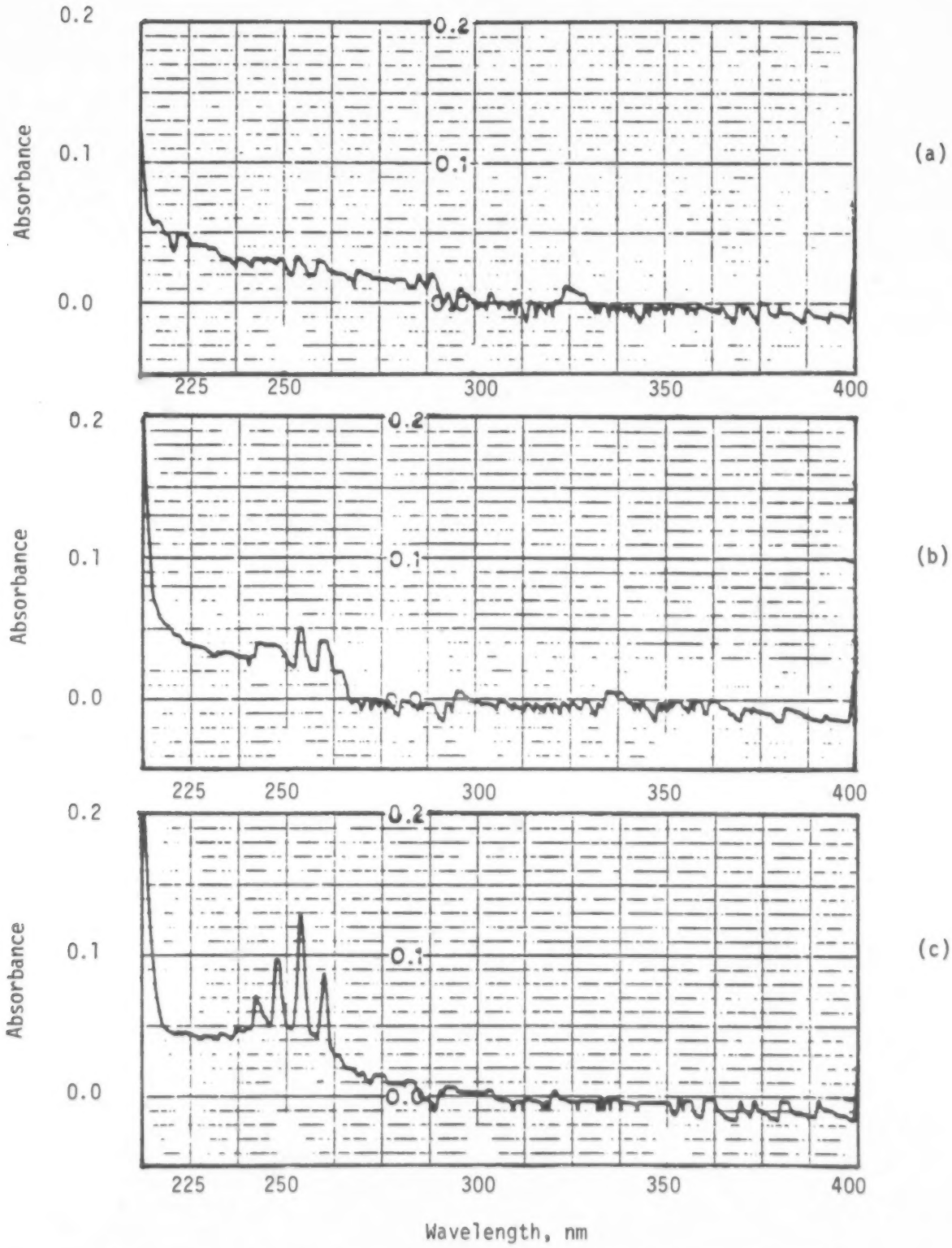

Figure 12. UV spectra of benzene standard in methanol obtained with reagent methanol reference on the Cary 14: (a) 5 ppm; (b) 25 ppm; (c) 50 ppm.

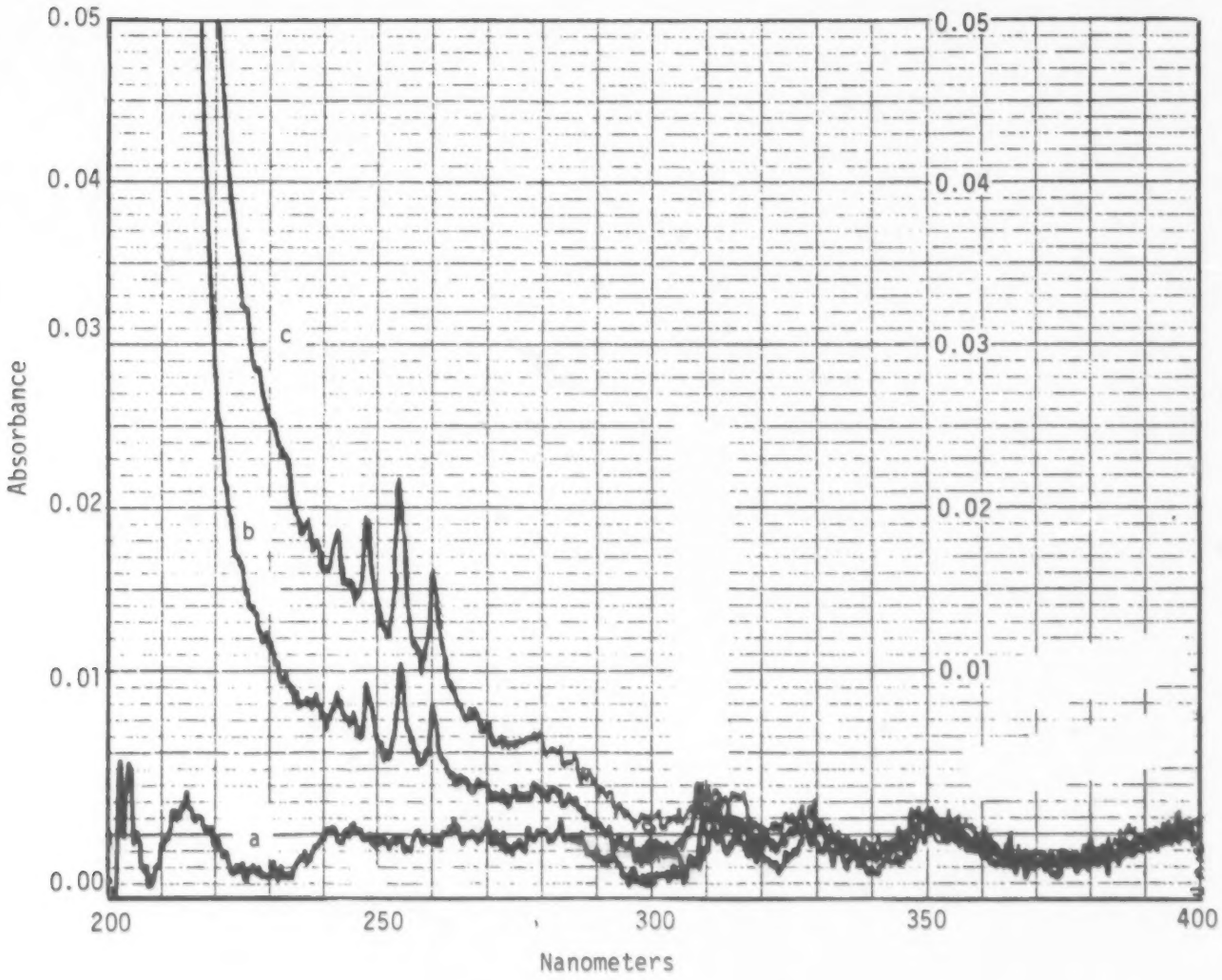

Figure 13. UV spectra of benzene standard in methanol obtained with reagent methanol reference on the Cary 17 using expanded range mode: (a) 0.0 ppm; (b) 2.5 ppm; (c) 5.0 ppm.

concentrations ranging from 0.0 to 5.0 ppm. These spectra were obtained using the expanded range mode, and it is evident from the figure that an absorbance reading of 0.005 is readily discernable from the background absorbance of the reagent blank which is well above the noise level of the instrument. However, it is not possible to determine whether the absorbance difference of 0.005 units will be evident in samples that contain the normal organic background material present in groundwater without actually performing spiking experiments on a variety of groundwater samples. All of the determinations made in this program were made under ideal conditions that will not exist in groundwater analyses. EDLs were not determined for each individual compound listed in Method 8610 because of the uncertainty of the matrix effects that may be encountered in groundwater. However, some estimates of detection limits can be made using the 0.005 absorbance unit difference between sample and reference by making several assumptions with respect to the method and compounds under consideration. These assumptions include the use of a 100 mL sample, an eluate volume of 5.0 mL of methanol or hexane and analysis without further concentration, as well as the use of an average molecular weight of 200 g/mole. EDLs estimated for these conditions versus molar absorptivities are presented in Table 10. The data in Table 10 indicate that the sensitivity of Method 8610 varies considerably for the aromatic compounds under consideration. As stated above, these estimates do not take into consideration possible matrix effects which may be encountered in groundwater, which as yet have not been investigated, and which could reduce the sensitivity of the method. It may be necessary to evaluate alternative approaches for the determination of Method 8610 analyte such as spectrofluorometric detection or gas chromatography with specific detection.

Until the matrix effects and background spectra of groundwater are evaluated, it will be difficult to estimate the value of using the λ_{max} of the downgradient sample extract to eliminate compounds from the analyte list of Method 8610. Nearly all compounds evaluated exhibit some UV absorption in the region near 250 nm and below. Also, due to one additive effects of the spectra of two or more compounds, the observed maxima could be misleading and result in the elimination of compounds which are actually present. Perhaps

TABLE 10. ESTIMATED DETECTION LIMITS OF AROMATIC COMPOUNDS BASED ON MOLAR ABSORPTIVITIES

Molar Absorptivity(ε)	Log ε	EDL, µg/L of Groundwater(a,b)
10^2	2.0	500
10^3	3.0	50
10^4	4.0	5
10^5	5.0	0.5

(a) EDL's are based on average molecular weight of 200 and a concentration factor of 20.

(b) Benzene, with a logε of 2.35 and a molecular weight of 78 would have an estimated detection limit of 87 µg/L, or 87 ppb.

the use of a wide decision range such as 50 nm would help overcome this potential problem.

EVALUATION OF U.S. EPA METHOD 3560

Column Cleanup Evaluation

The UV spectra of a methanol wash of a 6-mL C_{18} column is shown in Figure 14. This spectra was obtained with a reagent methanol reference, and shows that a cleanup procedure is essential to use the C_{18} columns as supplied by the manufacturer.

The UV spectra of concentrated hexane and methanol eluents versus reagent solvents obtained using Method 3560 are shown in Figure 15. These data indicate that the methanol wash specified in the method is adequate to clean up the C_{18} column, although there does appear to be some background in the 250 nm region. However, since hexane is used as an elution solvent in the procedure, it is essential to use this solvent in the cleanup procedure as well, as the extent of contamination of the C_{18} columns received from the manufacturer may not be known, and could easily vary from lot to lot. Since hexane is a much stronger reverse phase solvent than methanol, it should be a better cleanup solvent. A methanol rinse after the hexane wash is essential to remove most of the hexane from the column prior to equilibration with water since methanol is water miscible, and should be retained in the cleanup procedure.

One problem with the original Method 3560 procedure is the use of hexane as the first solvent after column loading with an aqueous sample. From a theoretical standpoint, hexane is a less polar reverse phase solvent than methanol, and if it was intended to use hexane first, then a second elution with methanol would be unnecessary since all organics should be eluted from the column with hexane. Also, hexane is not miscible with water, and it is possible that the hexane may not be a good solvent for elution since the column is wet, and the water layer on the column packing could prevent efficient elution of the column. The observed effect with hexane as the first elution solvent was to have a small layer of water in the hexane eluent

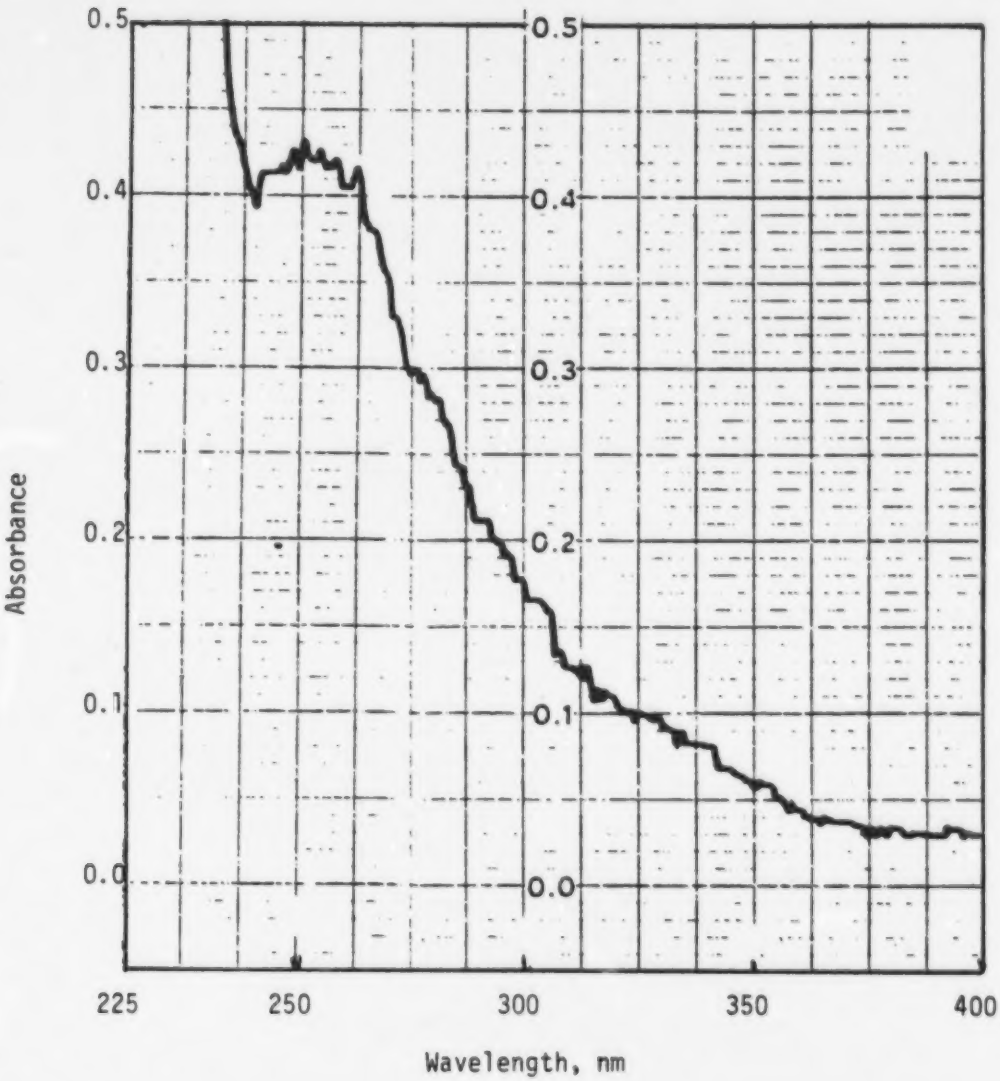

Figure 14. UV spectrum of methanol wash of 6-mL C_{18} column.

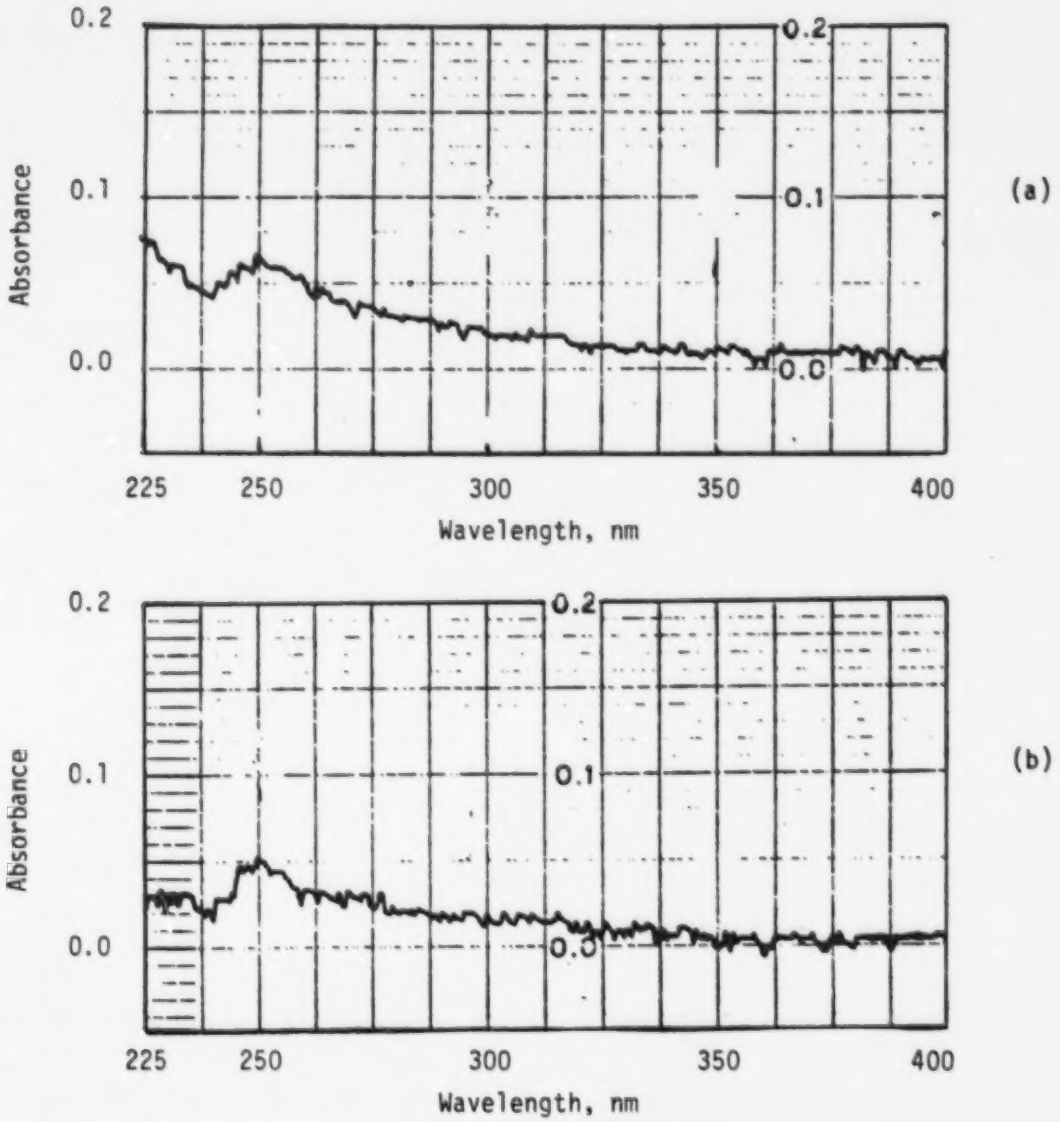

Figure 15. UV spectra of (a) concentrated hexane eluent and (b) concentrated methanol eluent from original method 3560 procedure.

fraction. The elution rate was also very slow due to the immiscibility of the water and hexane.

In reverse phase separations by HPLC, polar compounds are the first components to elute from the column, followed by less polar components. Therefore, it is more appropriate to elute the column with methanol first, followed by hexane. This solvent order is desirable since the methanol eluent will dry the column prior to hexane elution of the less polar components. Although there is still one minor problem, residual methanol in the hexane eluate due to the immiscibility of these two solvents, this is a more desirable situation than having water in the hexane phase. The UV spectra of methanol and hexane eluents obtained, versus reagent solvents, are presented in Figure 16 for column eluates obtained using the revised solvent order, and the revised cleanup procedure for the C_{18} columns.

Evaluation of Solvent Elution of Subset Compounds

Composite Group A. The UV spectra of the methanol eluates from spiked Group A compounds, obtained with a reagent methanol reference, are presented in Figure 17. The hexane eluent from the Group A experiment is shown in Figure 18. These data indicate that the majority of the UV absorbing components from Group A are removed from the column using methanol and that only a small amount is removed using hexane.

The UV spectrum of the 5-mL water rinse of the C_{18} column after spiking, but prior to solvent elution of the Group A compounds, is shown in Figure 19. This data suggests one of two possibilities: (1) the column was not fully equilibrated after cleanup and does not retain some of the polar compounds, or (2) the method used for column spiking was not appropriate and requires modification. The method of column spiking was evaluated, and no differences were observed for Group A compounds spiked by either of the two methods described in the experimental section. Additionally, no differences were observed after changing the volume of reagent water used to equilibrate the

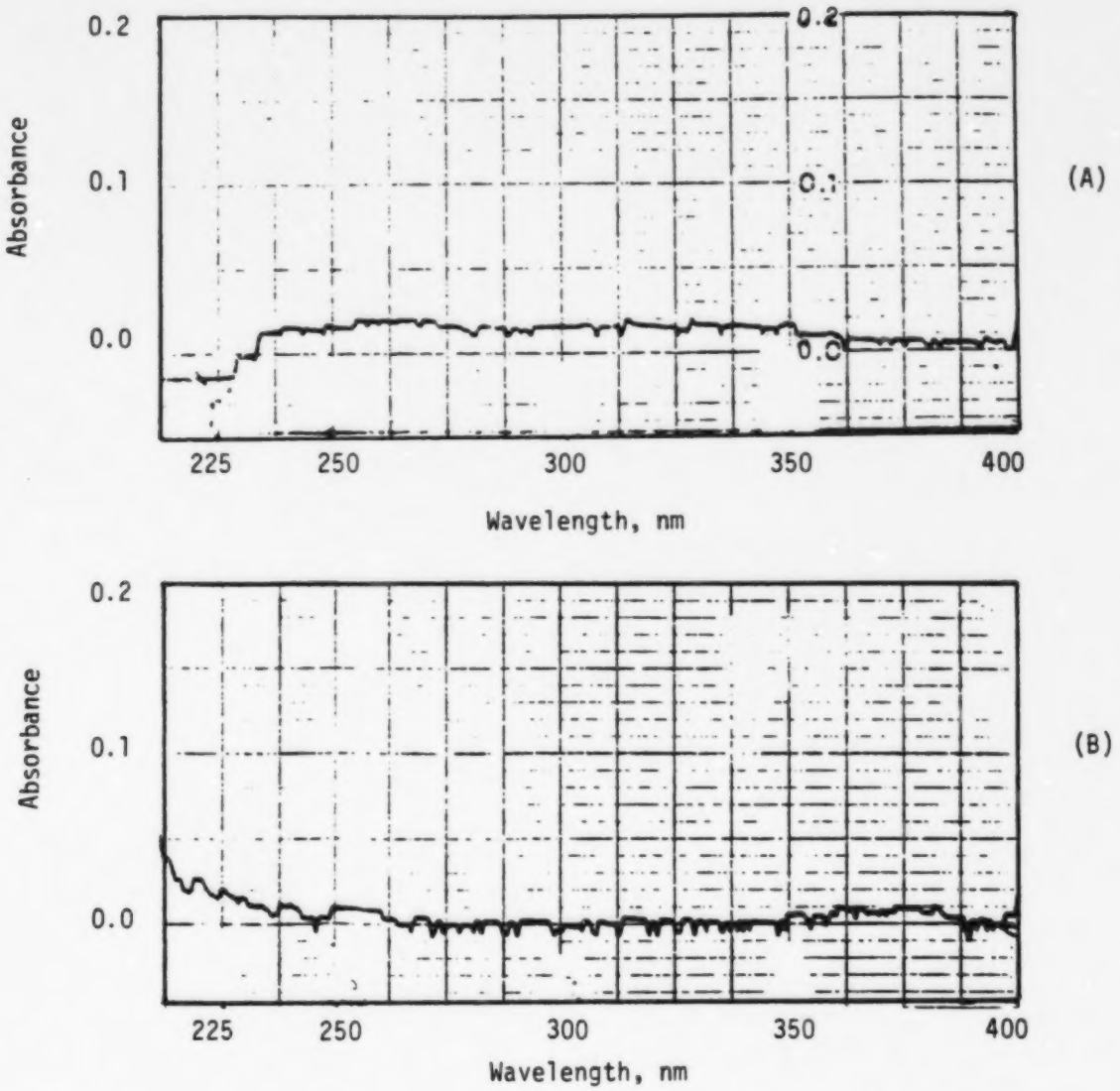

Figure 16. UV spectra of (a) method blank vs. reagent methanol and (b) method blank hexane vs. reagent hexane.

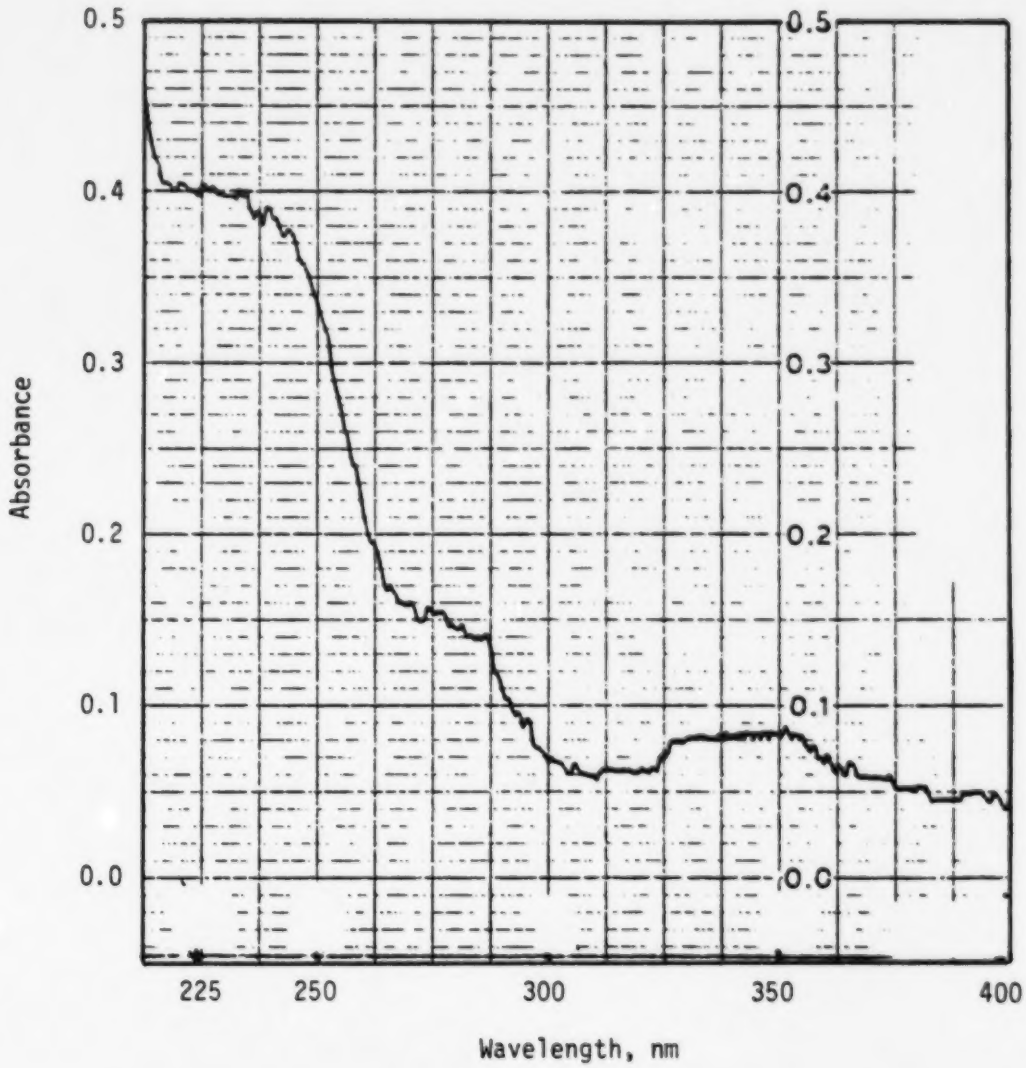

Figure 17. UV spectrum of methanol eluent from Group A spike obtained with reagent methanol reference.

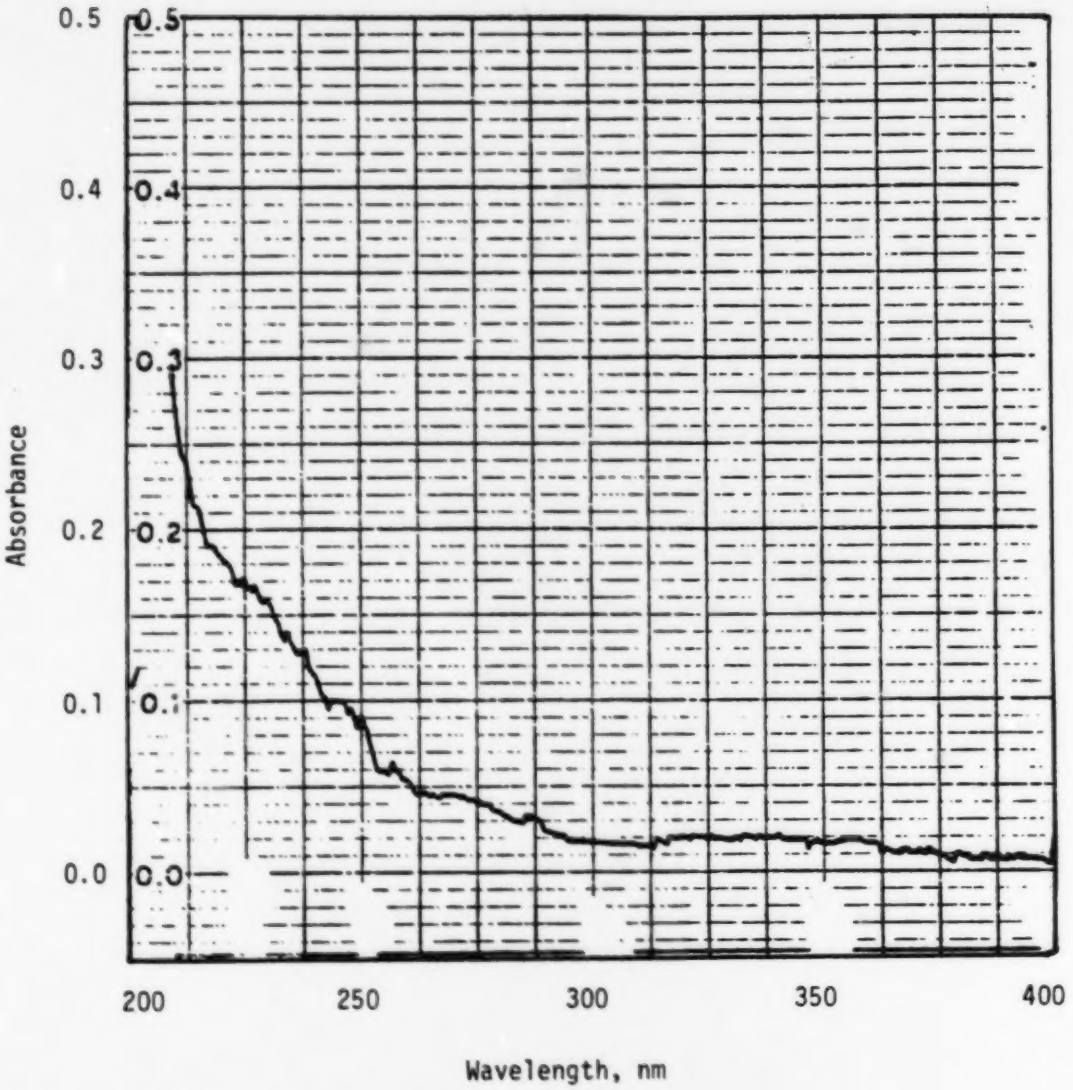

Figure 18. UV spectrum of hexane eluent following methanol wash from Group A spike obtained with reagent hexane reference.

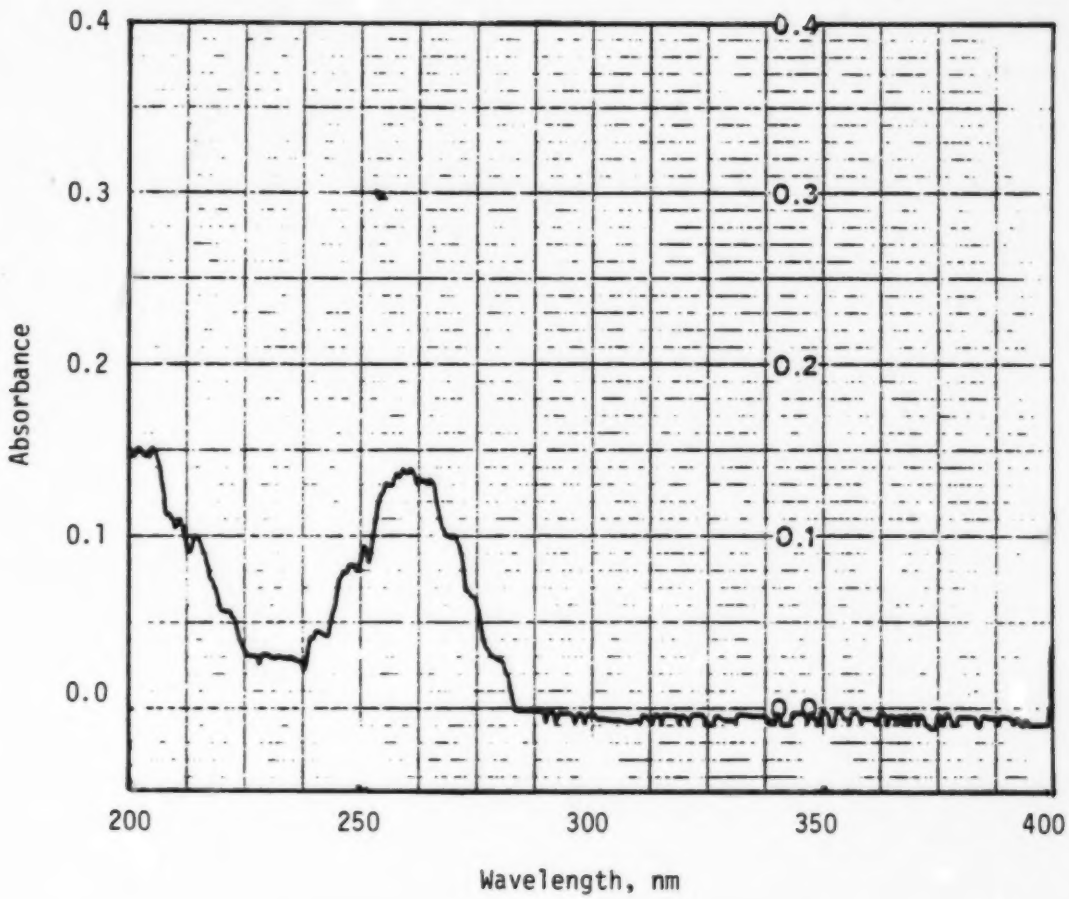

Figure 19. UV spectrum of water rinse of C_{18} column after spiking Group A compounds but prior to solvent elution obtained with reagent water reference.

reverse phase cartridge after column cleanup. Therefore, these experiments indicate that one or more of the compounds in the group were not retained on the cartridge.

Composite Group B. The methanol eluent UV spectrum of spiked Group B compounds, obtained with a reagent methanol reference, is presented in Figure 20, and the corresponding hexane eluent spectrum is shown in Figure 21. These data show again that a major portion of the UV absorbing compounds are removed from the column using methanol, and that a smaller portion are eluted from the column with hexane. Group B contains only polar compounds from the parameter list of Method 8610. Unlike the Group A compounds, no absorbance was observed for Group B compounds in the 5-mL water wash of the column obtained after spiking, but prior to elution with methanol and hexane.

Individual Compounds. The evaluation of elution characteristics and recoveries, of the individual subset compounds spiked onto the reverse phase cartridge, and eluted with water, methanol, and hexane, are presented in Table 11. These data suggest a number of conclusions regarding the application of Method 3560 to Method 8610 analytes.

The most important conclusion is that the extraction/elution procedure is not capable of group separation into polar and nonpolar compounds, as evidenced by the fact that nearly all of the seven nonpolar compounds are at least partially present in the methanol (polar) fraction. Although heptachlor was evaluated, the standard was found to be contaminated, and a new supply was not received in time to reevaluate its elution characteristics. Seven of the polar compounds in Table 11 are not completely eluted from the cartridge with methanol, and are present in one or both of the hexane eluates. The second hexane eluate is not a prescribed step in the Method 3560 procedure but was added during the evaluation to determine if all of the spiked compounds, were eluted from the column in the specified fraction. An interesting feature of the elution data presented in Table 11 is the fact that even though the greatest recovery of a given compound is obtained in the polar methanol eluate, complete column removal requires two hexane fractions for six of the 21 compounds evaluated. These results suggest that it might be possible to completely elute a given compound from the cartridge by increasing the volume of the methanol eluate.

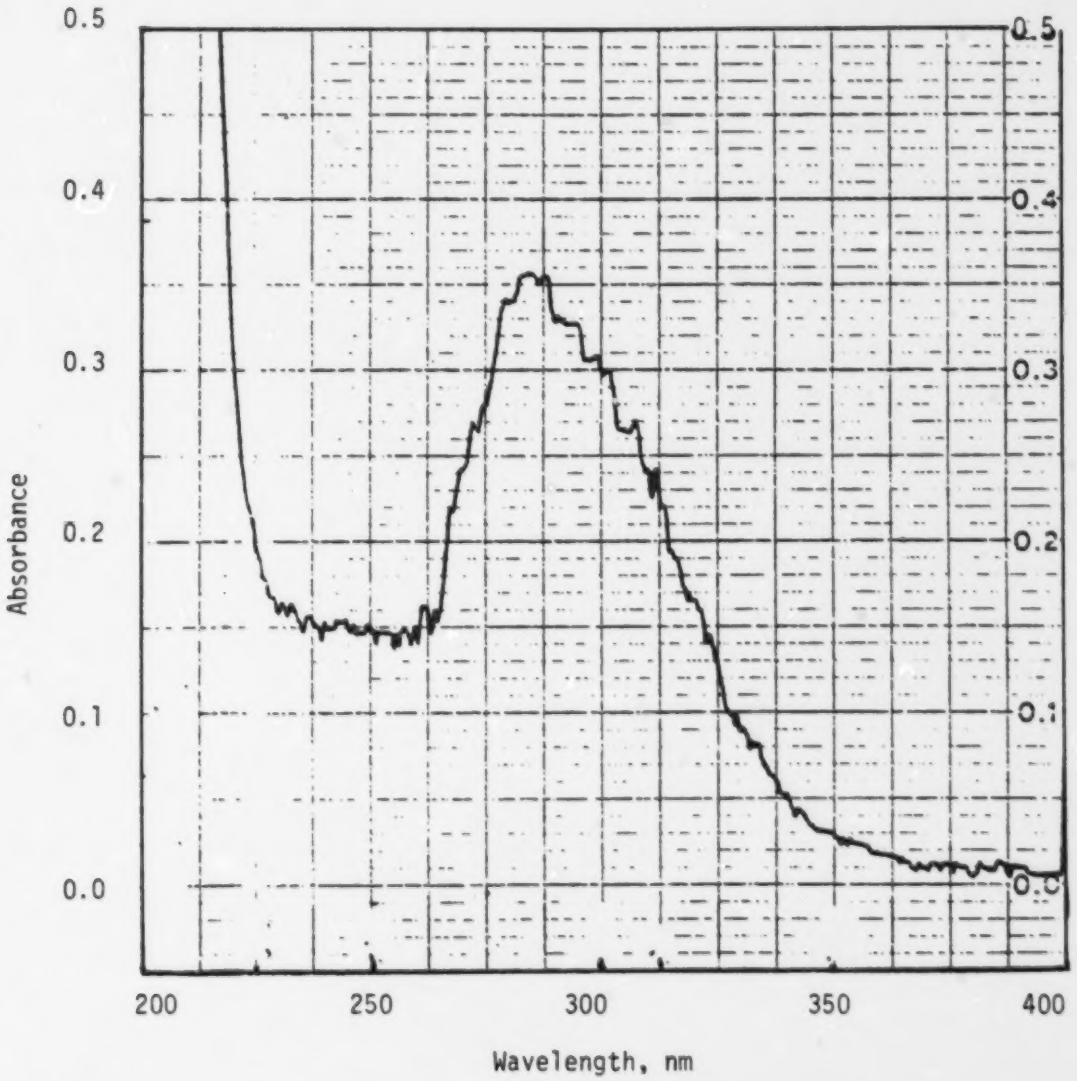

Figure 20. UV spectrum of methanol eluent from Group B spike obtained with reagent methanol reference.

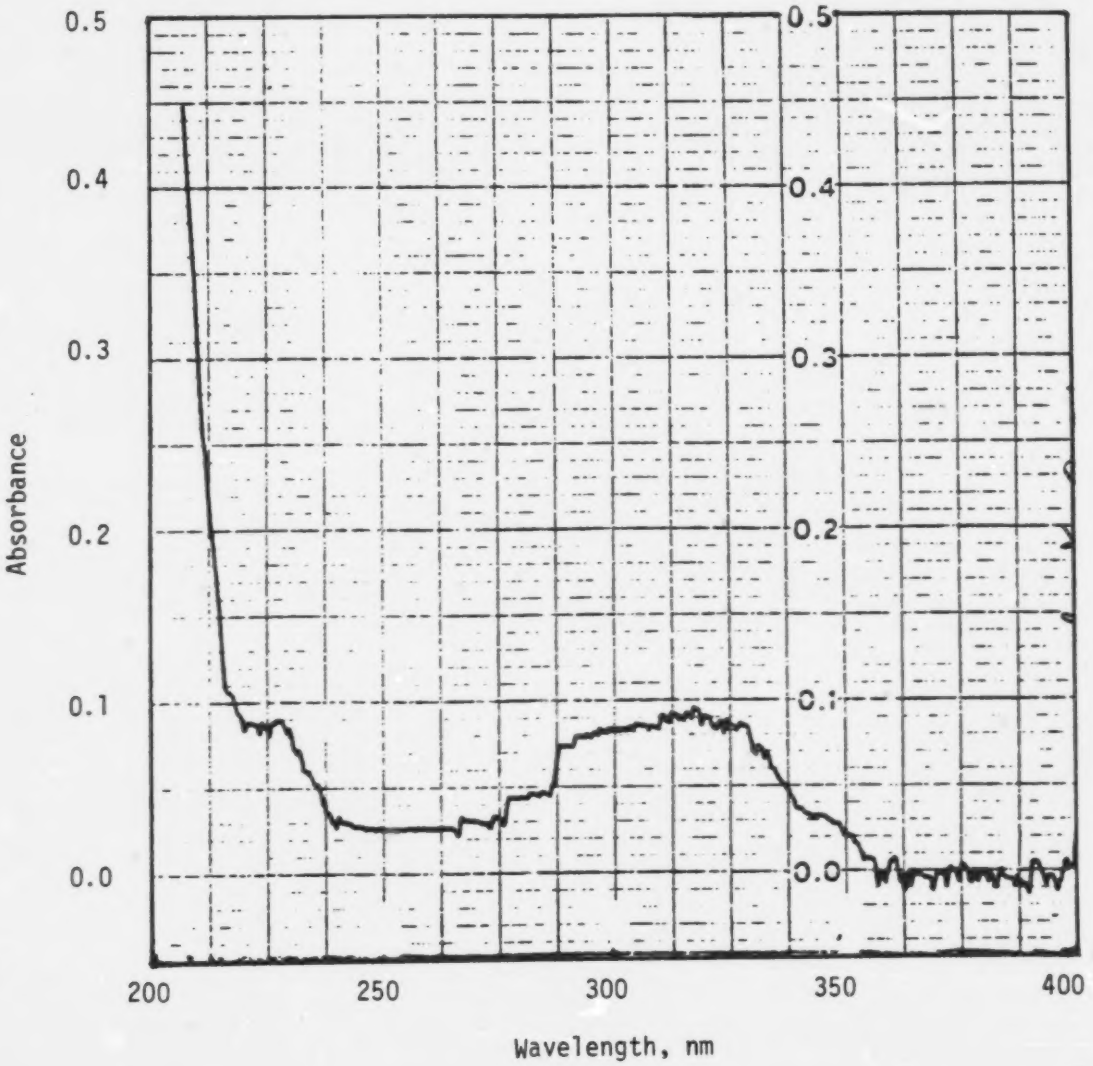

Figure 21. UV spectrum of hexane eluent from Group B spike obtained with reagent hexane reference.

TABLE 11. RECOVERY BY SOLVENT ELUTION OF SUBSET POLAR AND NONPOLAR AROMATIC COMPOUNDS SPIKED ONTO REVERSE PHASE CARTRIDGES

Compound	Amount Spiked, g per Cartridge	Percent Recovered in Given Elution Solvent										
		Reagent Water Rinse		Methanol Eluent		First Hexane Eluent		Second Hexane Eluent		Total Percent Recovery		
		Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Average
Nonpolar Aromatic Compounds												
Benzene	368.0	--(a)	--	21	21	18	15	10	13	49	49	49
Benzotrichloride	70.0	3	2	76	70	24	27	6	9	109	108	108
Dibenzo(a,j)acridine	9.2	--	--	11	11	4	5	--	--	15	16	16
1,3-Dichlorobenzene	2,575.0	--	--	62	62	15	30	--	--	77	92	84
Fluoranthene	10.0	--	--	57	51	50	54	8	6	115	111	113
Methoxychlor	27.3	--	--	74	74	40	43	--	--	114	117	116
Polar Aromatic Compounds												
Acetophenone	20.0	--	--	79	80	16	18	8	9	103	107	105
Aniline	10.0	8(b)	--	8	--	16	--	18	--	50	--	50
Butylbenzylphthalate	22.7	--	--	94	94	20	20	--	--	114	114	114
3,3'-dichlorobenzidine	10.6	--	--	92	69	--	--	--	--	92	69	80
(2,4-Dichlorophenoxy)acetic acid	25.9	19	23	68	68	10	8	--	--	97	99	98
2,4-Dimethylphenol	28.0	--	--	96	100	--	--	--	--	96	100	98
2,4-Dinitrophenol	20.2	--	--	95	98	--(c)	--(c)	--(c)	--(c)	95	98	96
2,6-Dinitrotoluene	19.8	13	4	66	54	26	29	11	11	79	58	68
1,2-Diphenylhydrazine	25.0	--	--	78	63	17	17	--	--	115	103	109
Methylparathion	34.8	--	--	90	93	9	10	6	6	107	110	108
1,4-Naphthoquinone	22.7	--	--	86	85	17	18	--	--	101	101	101
Pyridine	40.1	--	--	--	--	6	12	--	--	17	18	18
Strychnine	20.2	--	--	6	6	6	12	--	--	12	18	15

(continued)

TABLE 11. (Continued)

Compound	Amount Spiked, g per Cartridge	Percent Recovered in Given Elution Solvent								Total Percent Recovery		
		Reagent Water Rinse		Methanol Eluent		First Hexane Eluent		Second Hexane Eluent				
		Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Average
Thioacetamide	7.4	83	78	34	29	--	--	--	--	117	107	112
2,4,6-Trichlorophenol	87.5	--	--	74	77	18	18	--	--	92	95	94

(a) Dash (-) indicates compound not present in given fraction or replicate.
(b) Only one replicate for aniline.
(c) These fractions were not collected.

The results in Table 11 also show that there are a number of compounds which are apparently not completely retained by the cartridge and may not be extracted from aqueous samples. The levels found in the 5-mL water rinse of the cartridge, after spiking, show that four compounds, benzotrichloride,(2,4-dichlorophenoxy)acetic acid, 2,6-dinitrotoluene, and thioacetamide can be partially washed off the cartridge by water. In the case of benzotrichloride, the pre-elution volume is small and a water soluble impurity or decomposition product is suspected. In the other cases, high water solubility due to extreme polarity or acidity is the more probable cause.

The average total recovery of spiked compounds ranged from 68 to 116 percent for 16 of the 21 compounds evaluated. Recoveries of 50 percent or less were observed for the remaining five compounds, and these compounds included aniline, benzene, dibenzo[aj]acridine, pyridine, and strychnine. The reason for the loss of dibenzo[aj]acridine is suspected to be adsorption onto the plastic material used in the reverse phase cartridge extraction procedure. Losses of the other basic components are perhaps due to irreversible adsorption onto the silica support of the reverse phase sorbent.

SECTION 6

QUALITY ASSURANCE

The quality assurance objectives of this program were two-fold: (1) to provide reliable literature data such as λ_{max} and absorptivities for the method parameters listed in Method 8610; and (2) to verify the literature data for selected compounds using ultraviolet and visible spectrophotometry.

For the literature work conducted under this task, at least two references were sought for each of the 129 parameters of Method 8610. The spectral data obtained from the various sources listed in the reference section were presented in Table 4 for the polar compounds from the Method 8610 parameter list, and in Table 5 for the nonpolar compounds. At least two references were obtained for 105 of the method parameters, while only one reference was obtained for 13 of the method parameters. No literature references were obtained for 11 of the remaining method parameters, and these compounds were ordered from either the EPA repository or from commercial suppliers for UV or visible spectal determination. These data were presented in Table 9 of this report.

In the tabulation and entry of the literature data in the data base, at least one-third of the entries were checked by a researcher who was not responsible for the original entries in order to evaluate the data for entry errors. When entry errors were found, they were marked on a printout of the data and corrected in the data base. The entry errors were estimated to involve only 0.5 percent of the table entries.

For the instrumental analysis and sample extraction tasks of the program, the specific quality assurance measures consisted of the verification of calibration of the Cary 14M spectrophotometer with reference standards with respect to wavelength and absorbance readings, and the analysis of daily reagent blanks and replicate samples. The precision of

spectral acquisition was evaluated by the analysis of replicate calibration standards of benzene prepared in methanol, and these data are presented in Table 12.

TABLE 12. COMPARISON OF REPLICATE ANALYSES OF BENZENE STANDARDS BY UV SPECTROPHOTOMETRY

Concentration of Standard, mg/L[a]	Absorbance Reading for Given Replicate at 254 nm				S.D.	Theoretical R.S.D %	Percent Value[b]	Difference
	Rep 1	Rep 2	Rep 3	Average				
238	0.684	0.670	0.678	0.677	0.007	1.0	0.751	-9.0
210	0.670	0.668	0.674	0.671	0.003	0.4	0.663	+1.0
196	0.640	0.632	0.628	0.633	0.006	1.0	0.619	+3.0

(a) All solutions prepared in methanol.
(b) Calculated from data in Reference 7.

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APPENDIX A

METHOD 8610

TOTAL AROMATICS BY ULTRAVIOLET ABSORPTION

1.0 Scope and Application

1.1 Method 8610 is designed to measure total aromatics present in extracts of groundwater samples by measuring the UV absorption of the sample relative to a background sample or a method blank. This method may be used with extracts of groundwater prepared by Method 3560.

1.2 Method 8610 is a screening method that may only be applied to groundwater samples as provided in Method 8600. The UV screening of groundwater samples is a simple, sensitive, and inexpensive method of determining which Appendix VIII compounds may be present in the sample.

1.3 This method may be used to determine the absence of the following compounds:

Polar UV Compounds

Acetophenone
3-(alpha-Acetonylbenzyl)-4-hydroxycomarin, and salts
2-Acetylaminoflourene
4-Aminobiphenyl
Mitomycin C
5-(Aminomethyl)-3-isoxazolol
Amitrole
Aniline
Aramite
Auramine
Benzenethiol
Benzidine
p-Benzoquinone
N,N-Bis(2-chloroethyl)-2-napthylamine
Bis(2-ethylhexyl) phthalate
Brucine
Butyl benzyl phthalate
2-sec-Butyl-2,4-dinitrophenol (DNBP)
Chlorambucil
p-Chloroaniline
Chlorobenzilate
p-Chloro-m-cresol
2-Chlorophenol
Citrus red No. 2
Coal tars
Creosote
Cresols

2-Cyclohexyl-4,-dinitrophenol
Daunomycin
Diallate
Di-n-butyl phthalate
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
2,6-Dichlorophenol
2,4-Dichlorophenoxyacetic acid, salts and esters (2,4-D)
O,O-Diethylphosphoric acid, O-p-nitrophenyl ester
Diethyl phthalate
Diethylstilbesterol
Dihydrosafrole
3,4-Dihydroxy-alpha-(methylamino)methyl benzyl alcohol
3,3'-Dimethoxybenzidine
p-Dimethylaminoazobenzene
3,3'-Dimethylbenzidine
alpha,alpha-Dimethylphenethylamine
2,4-Dimethylphenol
Dimethyl phthalate
Dinitrobenzene, N.O.S.
4,6-Dinitro-o-cresol and salts
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octyl phthalate
Diphenylamine
1,2-Diphenylhydrazine
Isosafrole
Maleic hydrazide
Methapyrilene
4,4'-Methylenebis(2-chloroaniline)
Methyl parathion
1,4-Naphthoquinone
1-Naphthylamine
2-Naphthylamine
Nicotine and salts
p-Nitroaniline
Nitrobenzine
4-Nitrophenol
Parathion
Pentachloronitrobenzene (PCNB)
Pentachlorophenol
Phenacetin
Phenylenediamine
N-Phenylthiourea
Phosphorothioic acid, O,O-dimethyl O-(p((dimethylamino)-sulfonyl)phenyl) ester
Phthalic acid ester, N.O.S.
Phthalic anhydride

2-Picoline
Propylthiouracil
Pyridine
Reserpine
Resorcinol
Safrole
Strychnine and salts
Thioacetamide
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)
2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP)
sym-Trinitrobenzene
Trypan blue
Uracil mustard

Non-Polar UV Compounds

Benz(c)acridine
Benz(a)anthracene
Benzene
Benzene, dichloromethyl-
Benzo(b)fluoranthene
Benzo(j)fluoranthene
Benzo(a)pyrene
Benzotrichloride
Benzyl chloride
4-Bromophenyl phenyl ether
Chlorinated benzenes, N.O.S.
2-Chloronaphthalene
Chrysene
DDD
DDE
DDT
Dibenz(a,h)acridine
Dibenz(a,j)acridine
Dibenz(a,h)anthracene
7H-Dibenzo(c,g)carbazole
Dibenzo(a,e)pyrene
Dibenzo(a,h)pyrene
Dibenzo(a,i)pyrene
o-Dichlorobenzene
m-Dichlorobenzene
p-Dichlorobenzene
Dichlorobenzene, N.O.S.
7,12-Dimethylbenz(a)anthracene

Fluoranthene
Heptachlor
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachlorophene
Idenol(1,2,3-cd)pyrene
Methoxychlor
3-Methylcholanthrene
Naphthalene
Polychlorinated biphenyls, N.O.S.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)

2.0 Summary of Method

2.1 The extracted groundwater sample is reduced (or made up) to a volume of 1 ml and transfered to a quartz cuvette.

2.2 A reagent blank or an upgradient groundwater sample is extracted with the sample and the UV region, 310 nm to 220 nm, is scanned for each sample versus the reagent blank or the upgradient sample.

Note: This Method can also be used over a wide range. If compounds which absorb in the visable range are expected the scan range should be extended to 700 nm to 220 nm.

3.0 Interferences

3.1 A procedural blank should be performed prior to the use of this method. The level of interferences must be below the method detection limit before this method is performed on actual samples.

4.0 Apparatus and Materials

4.1 Quartz cuvettes, with a 1 cm path length. Cuvettes with a 1 cc volume are recommended.

4.2 Double beam, adjustable slit, UV/VIS spectrophotometer capable of scanning the range 700 nm to 220 nm with a recording device.

4.3 Disposable pipets.

5.0 Reagents

5.1 Methanol: ACS spectrophotometric grade.

5.2 Hexane: ACS spectrophotometric grade.

6.0 Sample Collection and Preservation

6.1 Since this method may destroy some compounds in the sample, subsequent analysis should be performed on a fresh sample aliquot.

6.2 If the sample will be analyzed by additional methods the sample should be stored at 4°C prior to any additional analyses. Samples should be completely analyzed within 4 weeks of extraction.

7.0 Procedures

7.1 Place the groundwater extract into the quartz cuvette. The sample volume may be adjusted by either reducing the volume under a stream of nitrogen or increasing the volume with either hexane or methanol (use whichever is appropriate depending upon the fraction being analyzed).

7.2 Place the upgradient groundwater extract (or the method blank) into another quartz cuvette using the same procedure as in 7.1.

7.3 Place the upgradient (or method blank) sample into the reference sample holder of the UV spectrophotometer and place the sample (downgradient) into the test sample holder.

7.4 Scan the spectrophotometer in the constant intensity (variable slit mode) over the range of 310 nm to 220 nm and record the results. The scan should take at least 1 min.

7.5 After the scan is complete place the sample extract back into the sample vial it was taken from. Rinse the cuvette twice with a small amount of the solvent used and add the rinses to the sample vial.

7.6 Repeat steps 7.1 through 7.5 for the other (polar or non-polar) extract.

8.0 Quality Control

8.1 Analyze the spiked duplicates and the spiked reagent blanks to verify the sensitivity and detection limits.

8.2 The spiked samples should yield an absorbance of about .005 (99% transmittance) in the range of 270 to 300 nm.

9.0 Detection Limits

9.1 The detection limits for the spiked compounds are as follows:

Floranthene	0.3 ppb
Parathion	4.0 ppb
Trichlorophenol	4.0 ppb

9.2 Detection limits for Appendix VIII compounds will vary depending on molar absorbtivity coefficiences. For example, the spiked reagent blank will contain 25 ng of Floranthene in 1 ml of hexane (λ_{max} = 286 nm; Σ = 45000). Therefore the absorbance will be

$$A = \frac{45000\,\lambda}{\text{cin-mole}}\ 1\text{ cm} \cdot 1.24 \times 10^{-7}\text{ moles/liter}$$

$$A = .0056$$

The cut-off used in deciding whether a compound was UV active was molar absorbtivity coefficient of 1000 or higher. Therefore a compound with a molecular wt of 250 gm/mole can first be detected at a level of:

$$.005 = \frac{1000\ 1}{\text{cin-mole}}\ 1\text{ cm} \times \text{moles/liter}$$

$$x = 5 \times 10^{-6}\text{ mole/l}$$

$$5 \times 10^{6}\text{ moles/l} \cdot 250\text{ gm/mole} = 1250 \times 10^{-6}\text{ gm/liter}$$

$$= 1.25\text{ mg/l}$$

Since we concentrated the sample 100:1 the detection limit of this method should be at least 12.5 ppb for all of the compounds listed.

10.0 Pass/Fail Criteria

10.1 The Pass/Fail criteria for groundwater samples determined using method 8610 is straight forward and utilizes the background correction supplied by the upgradient sample.

10.2 Since the up gradient sample is placed in the reference cell any absorption due to indigenous UV active compounds should be automatically subtracted out.

10.3 A ground water sample will fail method 8610 if the sample absorbs more than .005 absorbance units in the range from 310 nm to 220 nm.

APPENDIX B

METHOD 3560

REVERSE PHASE CARTRIDGE EXTRACTION

1.0 Scope and Application

1.1 Method 3560 is designed to quantitatively extract non-purgeable organic compounds from groundwater samples using reverse phase concentration cartridges. This method is available as an alternative to Methods 3510, 3520, and 3530 for groundwater screening as described in Method 8600.

1.2 Method 3560 is advantageous compared to the other extraction methods since it is simple and effective and requires a minimum of sample preparation.

2.0 Summary of Method

2.1 The groundwater sample is drawn up into a 50-ml syringe and a pre-cleaned RP cartridge is fitted on the syringe. The sample is forced through the cartridge. This process is repeated with an additional 50 ml of sample.

2.2 The cartridge is washed with distilled water and then eluted either sequentially (for compound fractionation) or entirely with appropriate solvents.

3.0 Interferences

3.1 A procedural blank should be performed prior to the use of this method. The level of interferences must be below the method detection limit before this method is performed on actual samples.

3.2 Procedures for the removal of interfering compounds coextracted with target compounds are described in the organic analytical method that will be used to analyze the sample.

4.0 Apparatus and Materials

4.1 Reverse phase C18 cartridges; (Water Sep Pac™, Analabs, or equivalent).

4.2 Glass Hypodermic Syringe; 50cc or larger.

4.3 Vials, 12 ml, borosolicate glass with Teflon Lined screw caps.

4.4 Distilled, deionized water.

4.5 Evaporation system (Pierce, Reacti-Therm™ system, or equivalent).

5.0 Reagents

5.1 Methanol: ACS reagent grade.

5.2 Hexane: ACS reagent grade.

6.0 Sample Collection, Preservation, Handling

6.1 Adhere to those procedures specified in the referring analytical methods for collection, preservation and handling.

6.2 After extraction of samples by this method, hexane and methanol extracts may be stored at 4°C prior to analysis. Sample extracts should be analyzed as soon as possible after extraction and should not exceed 4 weeks after extraction.

7.0 Procedure

7.1 Fill syringe with 5 ml methanol.

7.2 Attach reverse phase cartridge to the syringe and push the methanol through taking 1 min or more to completely empty the syringe.

7.3 Remove the cartridge and fill the syringe with 5 to 10 ml of distilled water.

7.4 Attach the cartridge and force the water through as before.

7.5 Remove the cartridge and fill the syringe with 50 ml of the sample groundwater.

7.6 Attach the cartridge and force the water sample through the cartridge at a rate of about 10 ml/min.

7.7 Repeat steps 7.5 and 7.6 with an additional 50 ml of sample.

7.8 Remove the cartridge and fill the syringe with 5 ml of distilled water. Attach the cartridge and force the distilled water through the cartridge as before.

7.9 Remove the cartridge and fill the syringe with 5-7 ml of hexane.

7.10 Attach the cartridge and force the hexane through 5 ml/min. Collect the hexane in a 12 ml vial.

7.11 At this point the sample volume should be reduced using an evaporation system that uses a stream of nitrogen and low heat (40-50°C). The sample volume should be reduced to ~.5 ml and made up to 1 ml with fresh hexane.

7.12 If the sample will not be analyzed immediately it should be sealed with a Teflon-lined cap and stored at 4°C until analysis.

7.13 Repeat steps 7.9 through 7.12 using methanol as the eluting solvent.

8.0 Quality Control

8.1 Every 10th sample or at least one sample in each set of samples should be a spiked duplicate. The sample should be spiked with 25 ng of fluoranthene, 0.4 µg of parathion and 0.4 µg 2,4,5 trichlorophenol.

8.2 Every 10th sample or at least one sample in each set of samples should be a spiked reagent blank. A 100-ml sample of distilled water should be spiked with 25 ng of fluoranthene, 0.4 µg of parathion and 0.4 µg of 2,4,5 trichlorophenol.

8.3 A reagent blank (i.e., distilled deionized water) should be run with each set of samples. This blank will be used to determine whether interfering compounds have been introduced during sample preparation.